

PHILIPS

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Portable v.h.f. dual-trace oscilloscope

PM 3260

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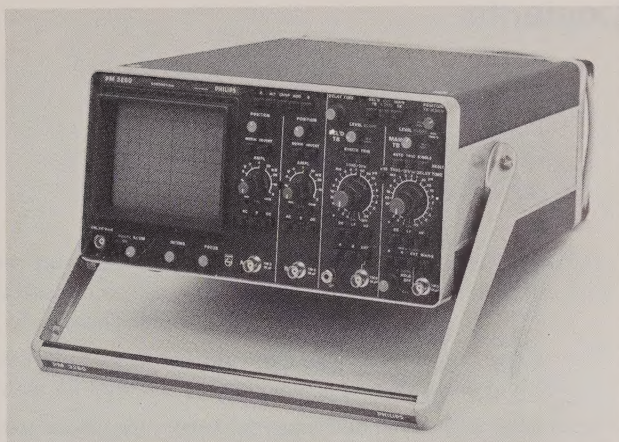
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PHILIPS



Operating manual

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1. General information

1.1. INTRODUCTION

The PM 3260 Portable v.h.f. oscilloscope enables the measurement of signals at a high sensitivity (5 mV/DIV) over a large bandwidth (120 MHz). The oscilloscope is provided with many thin-film circuits which guarantee a very stable operation and reduce the number of adjusting points.

There is a wide choice of display possibilities, such as one channel, two channels alternately or chopped, two channels added, with normal and inverted positions for both input signals, and a main and delayed time-base.

The PM 3260 oscilloscope features a tapless power supply with low dissipation. This power supply works on any a.c. voltage between 90 V and 264 V, thus obviating the need of adjusting the instrument to the local mains voltage.

All these features make the oscilloscope suitable for a wide variety of applications.

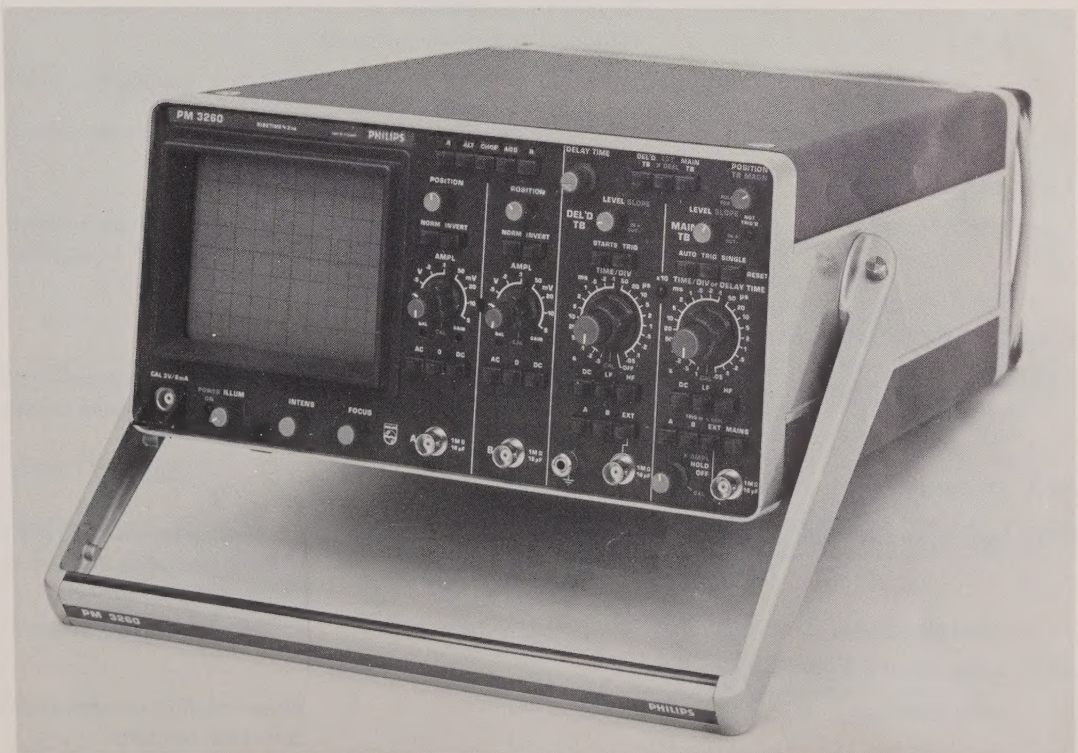


Fig. 1.1. Portable v.h.f. dual-trace oscilloscope PM 3260

1.2. CHARACTERISTICS

This specification is valid after the instrument has warmed up for 15 minutes. Properties expressed in numerical values with tolerances stated, are guaranteed by the manufacturer. Numerical values without tolerances are typical and represent the characteristics of an average instrument.

Designation	Specification	Additional information
1.2.1. C.R.T.		
Type	PHILIPS D14-240	Rectangular tube face, domed mesh type, post-accelerator, metal-backed phosphor
Measuring area	80 mm x 100 mm	
Screen type	P31 (GH) phosphor	P7 (GM) phosphor optional
Photographic writing speed	> 1500 cm/ μ s	Measured with Steinheil Oscillophot M5 camera. Aperture: 1:1,2 Object to image ratio: 1:0,5 Film: Polaroid 410 (10000 ASA) No pre-fogging Phosphor type P31 (GH)
Total acceleration voltage	20 kV	
Graticule	Internal	Continuously variable illumination
Engravings	Centimetre divisions with sub-divisions of 2 mm along the central axes. Dotted lines indicate 10 % and 90 % of measuring lattice for measurement of rise time	
1.2.2. VERTICAL OR Y AXIS		
1.2.2.1. Response		
Frequency range	d.c. ... 120 MHz 10 Hz ... 120 MHz	-3 dB bandwidth d.c. coupled -3 dB bandwidth a.c. coupled
Rise time	≈ 3 ns	
Pulse aberrations	± 3 % (4 % peak-to-peak)	
1.2.2.2. Deflection coefficients	5 mV/DIV ... 2 V/DIV	Nine calibrated positions in 1-2-5 sequence. Uncalibrated continuous control 1 : $\geq 2,5$
1.2.2.3. Error limit	± 3 %	
1.2.2.4. Max. permissible input voltage	± 400 V 800 V _{p-p} a.c.	d.c. + a.c. peak. Up to 20 mV position of input attenuator derating at frequencies over 500 kHz. See Fig. 1.2.
1.2.2.5. Instability of the spot position		
Trace jump	< 0,3 Div	When switching between any of the attenuator positions
Trace jump	< 0,3 Div	When switching the NORM/INVERT switch
Trace shift	< 0,3 Div	When rotating the continuous attenuator
Trace shift	< 1 Div	When switching to the ADDED position
Temperature drift	< 60 μ V/ $^{\circ}$ C	Typical value

Designation	Specification	Additional information
1.2.2.6. <i>Maximum deflection</i>		
Undistorted	24 divisions	
Shift range	16 divisions	8 divisions each in topward and downward direction reckoned from the central horizontal graticule line
1.2.2.7. <i>Input impedance</i>	1 MOhm//15 pF	
1.2.2.8. <i>Input RC time</i>	≥ 17 ms	Coupling switch to AC
1.2.2.9. <i>Visible signal delay</i>	Approximately 30 ns	
1.2.2.10. <i>Display modes</i>	Channel + or -A only Channel + or -B only Channels $\pm A$ and $\pm B$ chopped Channels $\pm A$ and $\pm B$ alternate Channels $\pm A$ and $\pm B$ added	
1.2.2.11. <i>Chopper frequency</i>	≈ 1 MHz	
1.2.2.12. <i>Cross-talk between channels</i>	1 : 500	2 divisions of signal amplitude at 50 MHz on one channel set to .2 V/DIV. Cross-talk is measured on other channel set to 20 mV/DIV
1.2.2.13. <i>Common-mode rejection factor</i>	100 at 100 kHz 100 at 2 MHz 20 at 50 MHz	Measured with +A and -B added; max. common mode signal 8 divisions
1.2.3. HORIZONTAL OR X AXIS		
1.2.3.1. <i>Display modes</i>	- Main time base - Main time base intensified by delayed time base - Delayed time base - XY Operation	X deflection by: - Channel A signal - Channel B signal - Signal applied to EXT connector of main time base - Mains frequency
1.2.4. MAIN TIME BASE		
1.2.4.1. <i>Operation</i>	Triggered Automatic Single shot	Possibility of automatic free-running in the absence of triggering signals
1.2.4.2. <i>Time coefficients</i>	1 s/Div ... 50 ns/Div	Twenty-three calibrated positions in 1-2-5 sequence. Uncalibrated continuous control 1 : $\geq 2,5$ between the steps
1.2.4.3. <i>Coefficient error</i>	± 2 % ± 3 %	+20 °C ... +30 °C +5 °C ... +40 °C Sweep accuracy over any two divisions of 10 DIV sweep is ± 5 %. Exclude the first and last DIV at the 5 ns and 10 ns magnified sweep rates.

Designation	Specification	Additional information
1.2.10. POWER SUPPLY		
<i>1.2.10.1. Mains voltages</i>	Any voltage between 100 and 240 V ± 10 % in one range	
<i>1.2.10.2. Mains frequency</i>	46 to 440 Hz	
<i>1.2.10.3. Probe power</i>	+ and -24 V	Not provided on PM 3260E model
<i>1.2.10.4. Power consumption</i>	45 W	
1.2.11. ENVIRONMENTAL CAPABILITIES		
<i>1.2.11.1. Ambient temperature</i>	+5 °C ... +40 °C -10 °C ... +55 °C -40 °C ... +70 °C	Rated range of use Limit range of operation Storage and transport conditions
<i>1.2.11.2. Altitude</i>	5 000 m 15 000 m	Operating Not operating
<i>1.2.11.3. Humidity</i>	The instrument meets the requirements of the IEC 50 B (CO) 142 recommendations	
<i>1.2.11.4. Shock</i>	The instrument meets the requirements of the IEC 68 Eb recommendations	
<i>1.2.11.5. Vibration</i>	The instrument meets the requirements of the IEC 68 F recommendations	
<i>1.2.11.6. Recovery time</i>	15 minutes for normal operation	Coming from -10 °C and going to +20 °C at 60 % relative humidity
1.2.12. MECHANICAL DATA		
<i>1.2.12.1. Dimensions</i>	Length 410 mm (16 1/4") Width 316 mm (12 1/4") Height 154 mm (6 1/8")	Excl. controls, cover and feet
<i>1.2.12.2. Weight</i>	9,3 kg (20.5 lbs)	
1.2.13. ACCESSORIES		
<i>1.2.13.1. Accessories delivered with the instrument</i>		
Two contrast filters		
Front cover with storage space		
Collapsible viewing hood PM 9366		
Banana - BNC adapter PM 9051		
CAL terminal - BNC adapter		
Manual		
<i>1.2.13.2. Optional accessories</i> PM 9355 AC CURRENT PROBE		
✓ PM 9335	Passive 1:1 probe	
PM 9351	Passive 10:1 probe	
PM 9358	Passive 100:1 high-voltage probe	
PM 9347*)	Active t.v. probe	
PM 9352*)	Active microminiature probe	
PM 9353*)	Active F.E.T. probe	
PM 8960	Rack-mounting adapter	
PM 8971	Camera flange	
PM 9380	Oscilloscope camera	
	Oscilloscope camera range Steinheil Oscillophot	

*) Auxiliary Probe Power Supply PM 9346 is necessary if these probes are to be used with the PM 3260E model.

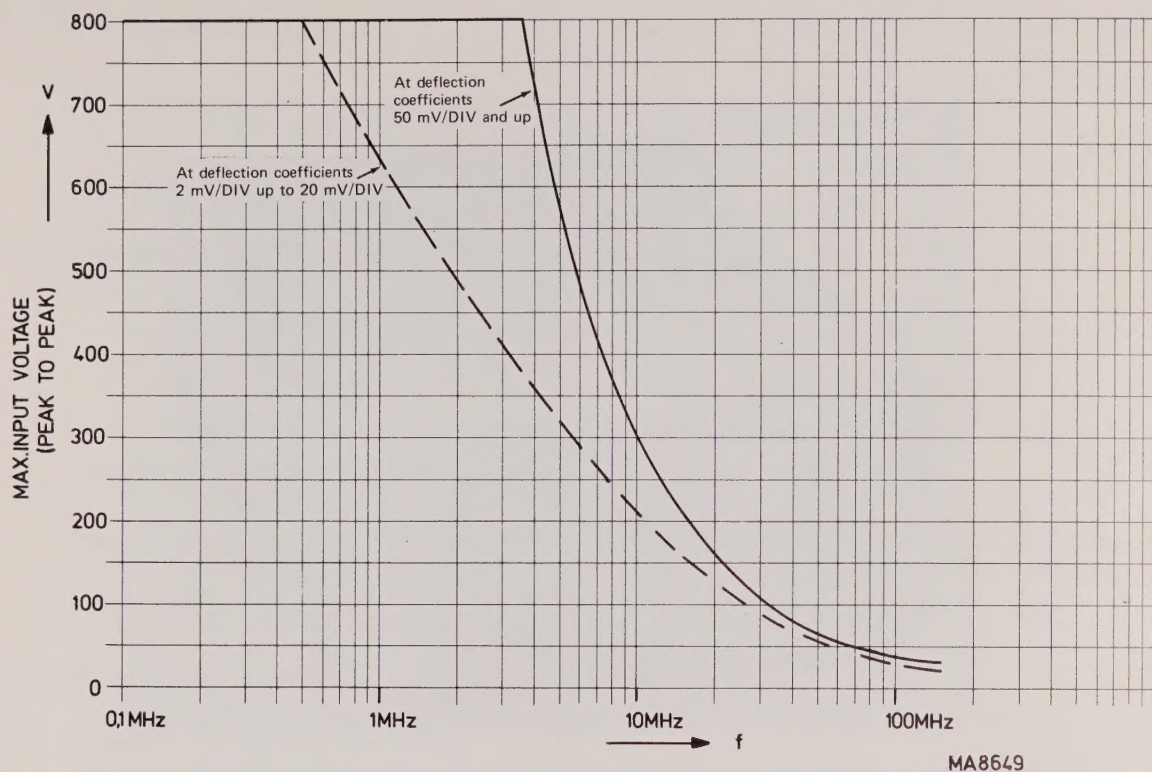


Fig. 1.2. Derating of the maximum permissible input voltage as a function of frequency

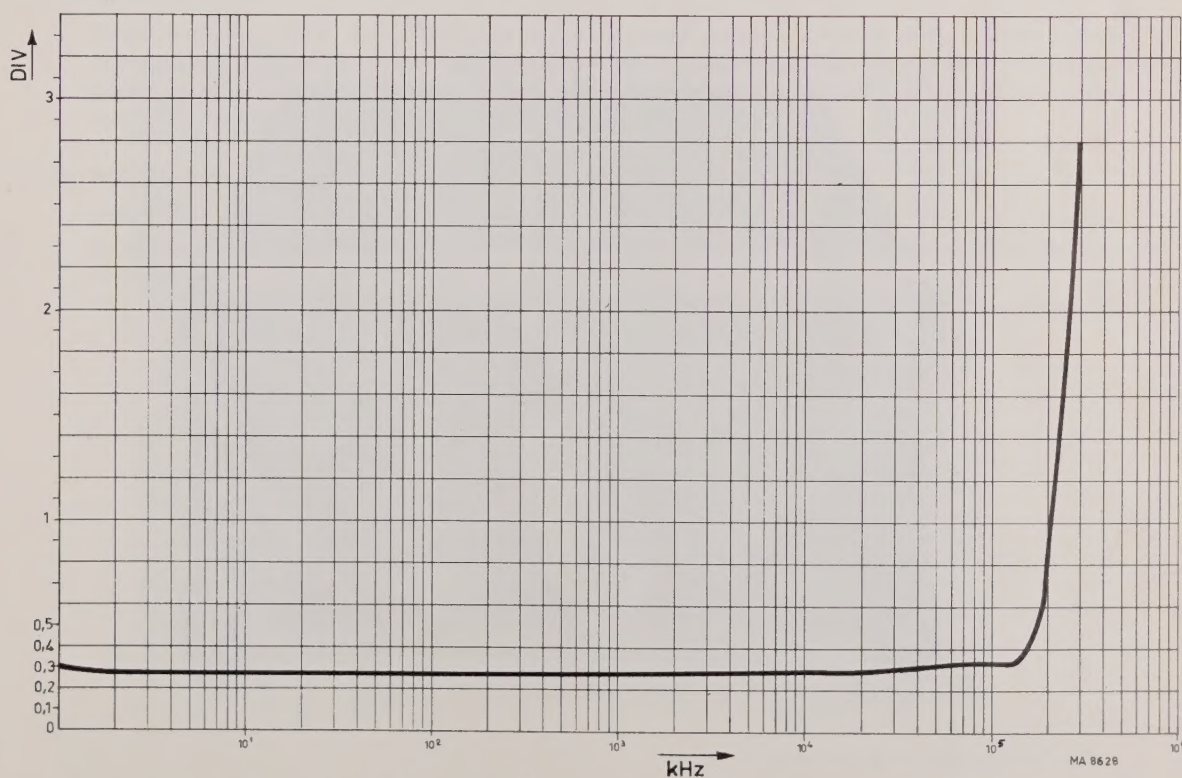


Fig. 1.3. Typical trigger sensitivity of channel A as a function of frequency

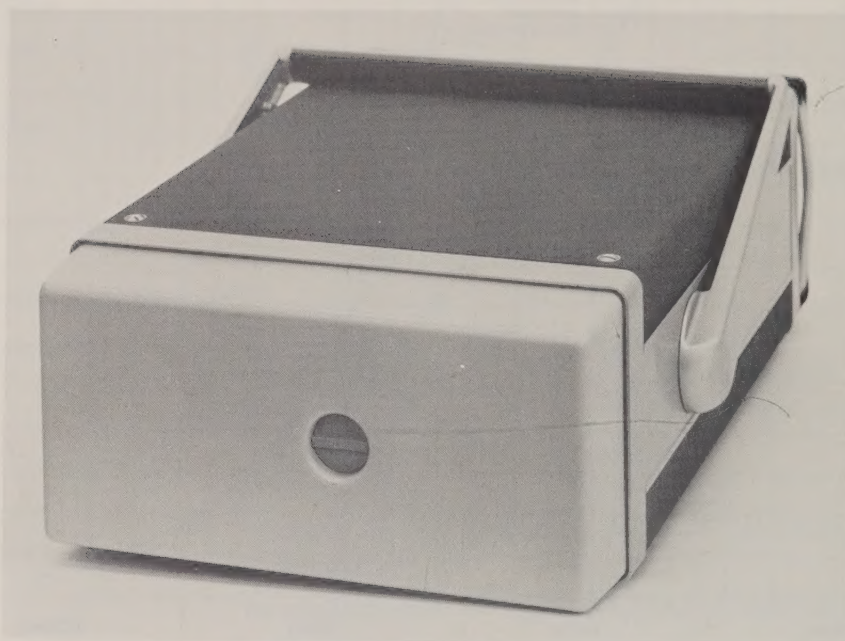


Fig. 2.1. Removing front cover

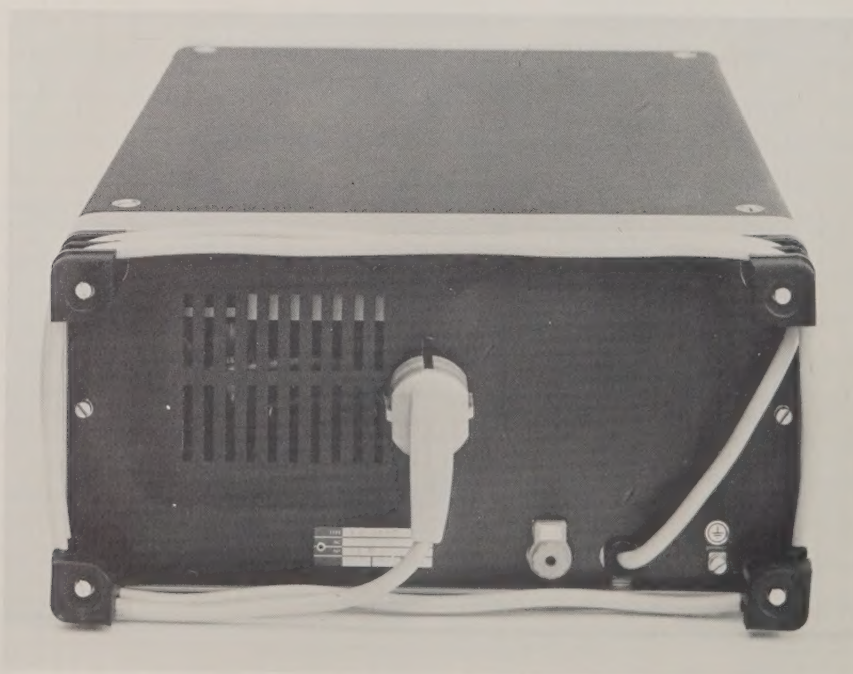


Fig. 2.2. Rear view of the instrument

2. Directions for use

2.1. INSTALLATION

2.1.1. Removing and fitting the front cover

- Removing: — Turn the knob in the centre of the cover a quarter of a turn anti-clockwise.
— Take the cover off.
- Fitting: — Align the key of the locking knob with the slot in the text plate of the instrument.
— Fit the cover over the front of the oscilloscope.
— Press the knob and turn it a quarter of a turn clockwise.

Remark: The handle can be rotated if the push-buttons on its bearings are depressed.

Warning: This instrument generates high voltages and should not be operated with the cabinet plates removed. The mains plug must be removed before attempting any maintenance work, and any relevant high-voltage points discharged.

2.1.2. Mains adjustment and fuse

The ability of the instrument to operate at any mains voltage between 90 and 264 V a.c., obviates the need of adaptation to the local mains voltage.

The fuse holder which is mounted on the rear panel carries a 2 A delayed action fuse. The use of repaired fuses and the short-circuiting of fuse holders is prohibited.

2.1.3. Earthing

In the interests of safety, the oscilloscope must be connected to earth via the rear earthing terminal (identified by the symbol ) or via the mains lead, provided that the supply socket is equipped with an earth connection. Care must be taken that the earth line to the oscilloscope is not interrupted due to the use of an extension lead or device which is not fitted with an earth conductor.

2.1.4. Switching on

The POWER switch is incorporated in the graticule ILLUMINATION control on the front panel, immediately below the screen bezel. The oscilloscope must never be switched on whilst any circuit board or block has been removed.

Never remove a circuit board or block until at least one minute after the oscilloscope has been switched off.

2.2. OPERATING INSTRUCTIONS

Before switching on, ensure that the oscilloscope has been correctly installed in accordance with section 2.1. INSTALLATION and that the precautions outlined have been observed.

2.2.1. Controls and sockets (Fig. 2.3.)

2.2.1.1. Vertical channels

A/ALT/CHOP/ADD/B	Display-mode controls; 5-way push-button switch.
A depressed	Vertical deflection is achieved by the signal connected to the input of channel A.
ALT depressed	The display is switched over from one vertical channel to the other at the end of every cycle of the time-base signal.
CHOP depressed	The display is switched over from one vertical channel to the other at a fixed frequency.
ADD depressed	Vertical deflection is achieved by the sum signal of channels A and B.
B depressed	Vertical deflection is achieved by the signal connected to the input of channel B. If no push-button is depressed, the instrument operates in the ALT mode.
POSITION	Continuously variable control giving vertical shift of the display.
NORM/INVERT	2-Way push-button switch for the inversion of the signal polarity. No push-button depressed has the same effect as the NORM button depressed.
AMPL.	Step control of the vertical deflection coefficients; 9-way switch.
AMPL./CAL. (blue)	Continuously variable control of the vertical deflection coefficients. In the CAL. position the deflection coefficient is calibrated.
BAL (screw-driver operated)	Continuously variable control of the direct voltage balance of the vertical amplifiers.
GAIN (screw-driver operated)	Continuously variable control of the overall gain of the vertical channels.
AC/0/DC	Signal coupling; 3-way push-button switch.
AC depressed	Coupling via a blocking capacitor
0 depressed	Connection between input circuit and input socket is interrupted and the amplifier input is earthed
DC depressed	Direct coupling No button depressed has the same effect as the AC button depressed.
A 1 MOhm - 15 pF	BNC input socket for channel A
B 1 MOhm - 15 pF	BNC input socket for channel B

2.2.1.2. Horizontal channel

DEL'D TB - EXT. X DEFL - MAIN TB	Horizontal-deflection controls; 3-way push-button switch.
DEL'D TB depressed	The horizontal deflection voltage is supplied by the delayed time-base generator.
EXT. X DEFL depressed	Horizontal deflection is achieved by an external signal applied to the input socket of the horizontal amplifier, by the channel A signal, by the channel B signal or by a mains-frequency signal.

MAIN TB depressed

The horizontal deflection voltage is supplied by the main time-base generator.

A part of the trace is intensified (except in position OFF of the TIME/DIV switch of the delayed time-base generator).

No button depressed has the same effect as the MAIN TB button depressed.

POSITION
TB MAGN

Continuously variable control giving horizontal shift of the display; incorporates a push-pull switch which increases the horizontal deflection coefficient by a factor 10. A pilot lamp labelled x10 lights up when the magnifier is in operation.

X AMPL/HOLD OFF

Continuously variable control of the horizontal deflection coefficients in case of external X deflection.

In case of X deflection by the main time base, this control can be used to increase the sweep hold-off time.

2.2.1.3. Main time-base generator

LEVEL

Continuously variable control to select the level of the triggering signal at which the time-base generator starts.

This control incorporates a push-pull switch which enables choice of triggering on the positive- or negative-going edge of the triggering signal.

NOT TRIG'D

Pilot lamp which lights up when the time-base generator is in waiting position.

AUTO - TRIG - SINGLE

Trigger-mode controls; 3-way push-button switch.

AUTO depressed

The main time-base generator is free-running in the absence of triggering signals.

TRIG depressed

The time-base generator is normally triggered.

SINGLE depressed

After operating the SINGLE button, the time-base generator runs only once upon receipt of a trigger pulse.
If no button is depressed, the instrument operates in the SINGLE mode.

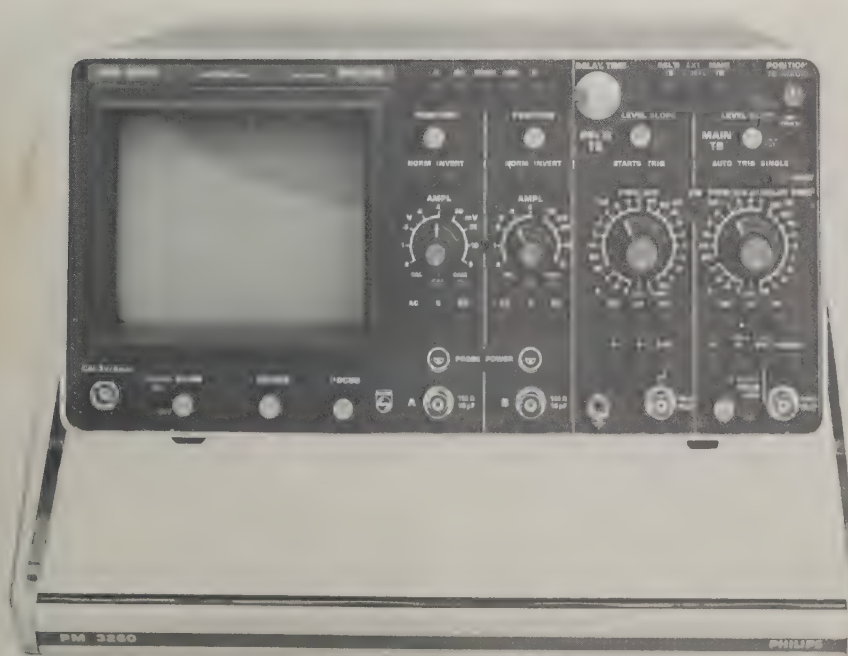


Fig. 2.3. Front view of the instrument

TIME/DIV or DELAY TIME	Time-coefficient control of the main time-base; 23-way rotary switch.
TIME/DIV - CAL (blue)	Continuously variable control of the time coefficient of the main time-base. In the CAL position the time coefficient is calibrated.
DC - LF - HF	Trigger coupling; 3-way push-button switch.
DC	Triggering signals are direct-coupled.
LF	Coupling via low-pass filter for frequencies up to 30 kHz (for external triggering via band-pass filter of 10 Hz - 30 kHz).
HF	Coupling via a high-pass filter for frequencies higher than 30 kHz. No push-button depressed has the same effect as button DC depressed.
TRIG or X DEFL	Trigger source or external X deflection selector; 4-way push-button switch.
A	Internal triggering or X deflection signal derived from channel A.
B	Internal triggering or X deflection signal derived from channel B.
EXT	Triggering on external signal connected to the adjacent 1 MOhm-15 pF socket. When the EXT X DEFL button of the horizontal deflection controls is depressed, this socket is connected to the input of the horizontal amplifier.
MAINS	Triggering or X deflection signal derived from an internal voltage with the mains frequency. No push-button depressed has the same effect as button A depressed.
1 MOhm - 15 pF	BNC socket for external triggering or horizontal deflection.

2.2.1.4. Delayed time-base generator

DELAY TIME MULTIPLIER	Continuously variable control of the delay time, operating together with the TIME/DIV controls of the main time-base generator.
LEVEL SLOPE	Continuously variable control to select the level of the triggering signal at which the delayed time-base generator starts. This control incorporates a push-pull switch which enables choice of triggering on the positive- or negative-going edge of the triggering signal.
STARTS - TRIG	Choice of the starting point of the delayed time-base generator after the delay time; 2-way push-button switch.
STARTS	The delayed time-base generator is started immediately after the delay time.
TRIG	The delayed time-base generator starts after the delay time upon receipt of a trigger pulse. No push-button depressed has the same effect as the STARTS button depressed.
TIME/DIV	Time-coefficient control of the delayed time-base; 23-way rotary switch. Incorporates an OFF position in which the delayed time-base generator is switched off.
TIME/DIV - CAL (blue)	Continuously variable control of the time coefficient of the delayed time-base generator. In the CAL position the time coefficient is calibrated.

DC - LF - HF	Trigger coupling; 3-way push-button switch.
DC	Triggering signals are direct-coupled.
LF	Coupling via low-pass filter for frequencies up to 30 kHz (for external triggering via band-pass filter of 10 Hz to 30 kHz).
HF	Coupling via a high-pass filter for frequencies higher than 30 kHz. No button depressed has the same effect as the DC button depressed.
A - B - EXT	Trigger source control; 3-way push-button switch.
A	Internal triggering signal derived from channel A.
B	Internal triggering signal derived from channel B.
EXT	Triggering on an external signal connected to the adjacent 1 MOhm-15 pF socket. No button depressed has the same effect as the A button depressed.
1 MOhm - 15 pF	BNC input socket for external triggering signal.
2.2.1.5. Cathode-ray tube	
ILLUM	Continuously variable control of the graticule illumination; incorporates mains switch. Pilot lamp indicates the ON state.
POWER	
INTENS	Continuously variable control of the trace brilliance.
FOCUS	Continuously variable control of the electron-beam focusing.
2.2.1.6. Miscellaneous	
CAL	Output socket on which a square-wave voltage of 3 V _{p-p} and a current of 6 mA at a frequency of 2 kHz are available. Amplitude accuracy: ±1 %. Frequency accuracy: ±2 %. The output is protected against continuous short-circuits.
PROBE POWER	Power socket for active accessories; supplies +24 V and -24 V.
⏏	Measuring-earth socket

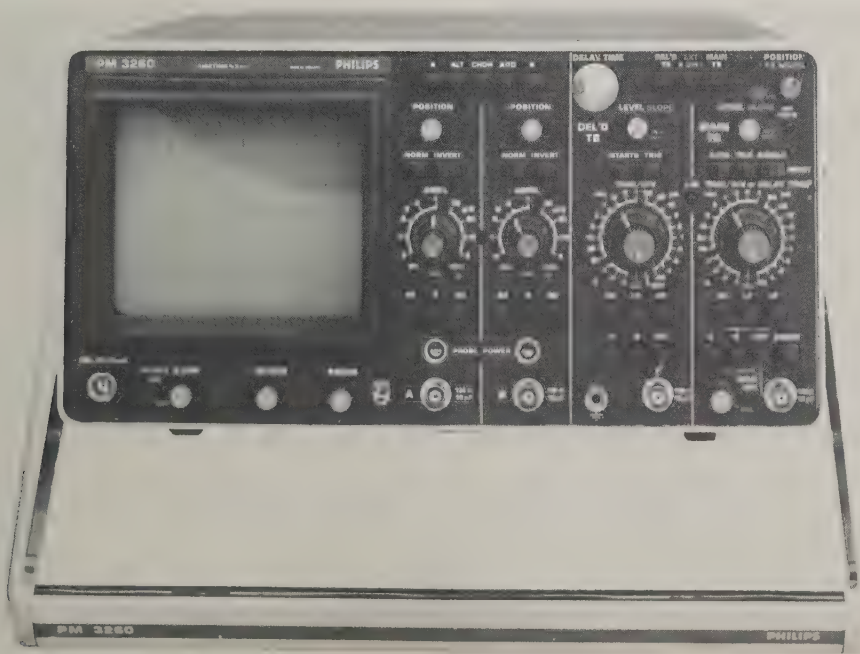


Fig. 2.3. Front view of the instrument

2.2.2. Preliminary settings

As the following settings are identical for both vertical channels, only the procedure for channel A has been indicated.

2.2.2.1. Adjusting the d.c. balance

- Operate push-button A of the display-mode controls.
 - Operate push-button AUTO of the trigger-mode controls.
 - Operate push-button MAIN TB of the horizontal deflection controls.
 - Set the AMPLitude switch to 5 mV and the continuous control to CALibrated.
 - Centre the trace with the POSITION controls.
 - Set the INTENSity and FOCUS controls for a sharp, well-defined trace.
- The controls not mentioned may occupy any position.
- Check that the trace does not jump when the AMPL switch is switched between the 5 and 10 mV positions.
- If necessary, readjust the BALANCE control on the front panel immediately below the AMPLitude control.

2.2.2.2. Adjusting the gain

Unless otherwise stated, the controls occupy the same position as in the previous adjusting procedure.

- Set the AC-0-DC switch to DC.
 - Set the AMPLitude switch to .5 V and the continuous control to CALibrated.
 - Connect the CALibration socket to the A input socket.
 - Check that the trace height is exactly 6 divisions.
- If necessary, readjust the GAIN control on the front panel, immediately below the AMPLitude switch.

2.2.3. Inputs A and B and their possibilities

The oscilloscope has been provided with two identical channels, each of which can be used for either YT measurements in combination with one or both time-base generators, or XY measurements in combination with the external horizontal channel.

2.2.3.1. YT Measurements

To display one signal, either of the two vertical channels can be selected by operating either push-button A or push-button B of the display-mode controls.

When push-button ALT or CHOP is depressed, two different signals can be displayed simultaneously. The Y deflection coefficient and the polarity can be selected for each channel individually. When the ALT button is operated, the display is switched over from one channel to the other at the flyback of the time-base signal. Although the ALTERNATE mode can be used at all sweep speeds of the time-base generator, the CHOPPED mode will give a better display quality for long sweep times, because during these long sweep times the alternate display of the two input signals is clearly visible to the eye.

In the CHOPPED mode, the display is switched over from one channel to the other at a fixed frequency. If push-button ADDED of the display-mode switch is operated, the signal voltages of both vertical channels are added. Depending on the positions of the polarity switches, either the sum or the difference of the input signals is displayed. The ADDED mode also enables differential measurements. With these measurements advantage is taken from the common mode rejection in the ADDED position. When the polarity switches of both channels are set to opposite positions, the common mode parts of the signals on sockets A and B will undergo a very slight amplification only, with respect to the differential mode parts.

2.2.3.2. XY Measurements

If push-buttons EXT X DEFL of the horizontal-deflection controls and A of the TRIG OR X DEFL controls are operated, the time-base generators are switched off. A signal applied to the vertical A channel is then used for horizontal deflection. The AC/0/DC switch and the step attenuator of channel A remain operative. Continuous control of the deflection coefficients is possible with the X DEFL/HOLD OFF control and horizontal trace shift with the X POSITION control.

Vertical channel B may also be used for X deflection.

To this end, the B button of the TRIG OR X DEFL controls is depressed.

It is also possible to use an internal voltage at the mains frequency or a signal applied to the EXT socket at the bottom right-hand side of the front panel for X deflection, after depressing the relevant push-button of the TRIG OR X DEFL controls. In these modes the trace width can be controlled with the X DEFL/HOLD OFF potentiometer.

With this potentiometer in its CAL position, the deflection coefficient for external signals is 300 mV/DIV.

The external signal can be either d.c. or a.c. coupled (lower frequency limit 10 Hz) by depressing either the DC or the LF push-button of the trigger coupling controls of the main time-base.

2.2.3.3. AC/0/DC switch

The signals under observation are fed to input socket(s) A and/or B and the AC/0/DC switch is set to either AC or DC, depending upon the composition of the signal. As the vertical amplifier is d.c. coupled, the full bandwidth of the instrument is available and d.c. components are displayed as trace shifts in the DC position of the AC/0/DC switch.

This may be inconvenient when small signals superimposed on high d.c. voltages must be displayed. Any attenuation of the signal will also result in attenuation of the small a.c. component. The remedy is to use the AC position of the input switch, which employs a blocking capacitor, to suppress the d.c. and l.f. signals. Some pulse droop will occur when l.f. square-wave signals are displayed.

The 0 position interrupts the signal and earths the amplifier input for quickly determining the 0 V level.

2.2.4. Triggering

If a signal must be displayed, the horizontal deflection must always be started on one fixed point of the signal in order to obtain a stationary display. The time-base generator is, therefore, started by narrow trigger pulses formed in the trigger unit and controlled by a signal originating from one of the vertical input signals, an internal voltage at mains frequency or an external source.

2.2.4.1. Trigger coupling

Three different trigger-coupling methods can be chosen with the DC/LF/HF switch. In the HF and LF positions, the transfer characteristic is limited.

In position DC the trigger signal is passed unchanged.

In position LF, a 0 Hz (10 Hz for external triggering) to 30 kHz band-pass filter is inserted. This position can be used to reduce interference from noise.

In position HF, a 30 kHz high-pass filter is inserted.

This position can be used to reduce interference from e.g. hum.

2.2.4.2. Selecting the trigger source and setting the trigger level

The trigger signal is obtained from channel A (button A depressed), channel B (button B operated), an external source (button EXT depressed) or from an internal voltage at mains frequency (button MAINS depressed).

The trigger pulse shaper is a dual-controlled multivibrator switched by the output signals of a differential amplifier.

The trigger signal, which is not affected by the continuous AMPLitude control, is, together with direct voltages which are adjustable with the LEVEL potentiometer, fed to the inputs of the differential amplifier.

Depending on the LEVEL setting, a certain part of the trigger signal will be amplified by the differential amplifier.

The multivibrator is thus switched at a fixed point of the trigger signal (see Fig. 2.4.). This means that, with the aid of the LEVEL control, it is possible to scan the shape of the trigger signal (in case of internal triggering A or B equal to the shape of the signal to be displayed) and, thus, to choose the point where the multivibrator will be switched.

The LEVEL potentiometer is fitted with a push-pull switch which allows selection of the trigger slope.

2.2.4.3. Automatic triggering

When the AUTOMATIC button of the AUTO-TRIG-SINGLE switch is operated, and if there are no trigger pulses available, the time-base generator is automatically free-running.

The trace is, therefore, always visible. The AUTOMATIC mode can be used in all cases where also the TRIG mode is usable, except with signal frequencies lower than 10 Hz or pulse trains with an off time exceeding 100 ms.

As soon as trigger pulses are available, the free-running state of the time-base generator is automatically terminated and the time-base generator is triggered again as described in sections 2.2.4.1. and 2.2.4.2.

When the TRIGGERed or SINGLE button is operated, the auto-circuit is switched off. The LEVEL setting can also be used in the AUTOMATIC mode.

2.2.4.4. SINGLE sweep triggering

When effects which occur only once have to be observed (usually photographed), it is often desirable to ensure that only one sawtooth is generated, even though several trigger pulses might be produced after the phenomenon of interest. Of course, the single sawtooth in question must be triggered by a trigger pulse. To this end, the SINGLE button must be pressed. The first trigger pulse that appears after the button has been released will start the time-base generator.

The time-base generator is then blocked until the SINGLE button is pressed again. The NOT TRIG'D lamp will light up as soon as the SINGLE button has been released, until the trigger pulse arrives.

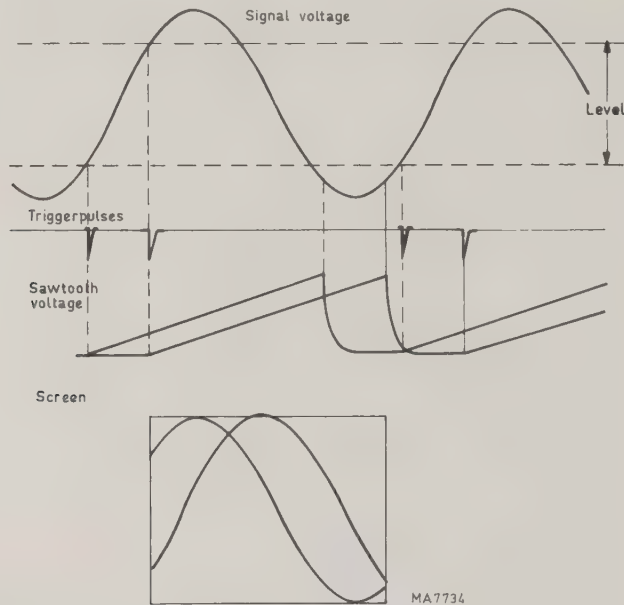


Fig. 2.4. Scanning the waveform by means of the LEVEL potentiometer

2.2.5. Time-base MAGNifier

The time-base magnifier is operated by a two-position push-pull switch incorporated in the horizontal-POSITION control. If this switch is pulled to position x10, the sweep speeds of the main time-base generator are increased by a factor of 10. Thus, the portion of the signal displayed over a width equal to one division in the centre of the screen in the x1 position (T B MAGNifier depressed), will occupy the full width of the screen in the x10 position.

Any portion of the trace can be brought on to the screen by the horizontal-POSITION control for scrutiny. In the x10 position, the time coefficient is determined by dividing the indicated TIME/DIV value by 10.

2.2.6. Use of the delayed time-base

The delayed time-base can be used for the accurate study of complex signals. When push-button STARTS of the STARTS/TRIG controls is operated, immediately the delayed-time base is on (i.e. the TIME/DIV switch is not at OFF), a portion of the displayed signal is intensified in the MAIN TB position of the horizontal deflection controls. The DELAY TIME control enables this intensified portion to be shifted along the time axis. The duration of the intensified portion, its length, can be controlled in steps and continuously by means of the TIME/DIV controls of the delayed time-base generator. When push-button DEL'D TB of the horizontal deflection controls is operated, the intensified portion occupies the full width of the screen. In the DEL'D TB position, the delay time, (i.e. the interval between the starting point of the main time-base and the starting point of the delayed time-base) is determined by the settings of the main TIME/DIV controls and the DELAY TIME control.

If the TRIG button of the STARTS/TRIG controls is operated, the delayed time-base is started by the first trigger pulse that occurs after the selected delay time. This trigger pulse is supplied by the trigger unit of the delayed time-base generator. This position is used when time jitter would otherwise give a blurred image of the detail under observation. This time jitter could be part of the signal being investigated or, at extreme magnifications, originate in the time-base circuits.

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Eindhoven - Netherlands

PARTS LISTS AND CIRCUIT DIAGRAMS
(Subject to alteration without notice)

Ordering code	Description	Qty.	Ordering code	Description	Qty.
MECHANICAL PARTS					
5322 447 94145	EXTENDED ALU GIRDER	2	5322 105 34019	MAIN TR SWITCH	1
5322 447 94144	CAST ALU BACK PLATE	1	5322 105 34021	FIELD TR SWITCH	1
4822 502 30047	SELF TAPPING SCREW	8	5322 414 14011	SINGLE HITTON(SK1..)	1
5322 532 14174	EARTHING RING (SPEC)	8	5322 462 44155	FINER(HOTTON SIDE)	4
5322 532 74014	RING(COMP SITE)	1	5322 532 14526	RING(10-THORN DIAL)	1
5322 462 34121	PRINT SUPPORT	4	5322 492 64394	LEAF SPRING(EARTHING)	1
5322 505 14185	NUT(SPEC)FOR ATT.SK.	2	5322 320 10064	CABLE COMP.	1
5322 462 54085	MIL-METAL SCREFFINING	1	5322 255 44026	10-WAY TERMINALSTRIP	1
5322 150 14013	CORRECTION COIL	1	4822 253 30025	FUSE 2A 5.B.	1
5322 535 94656	PLASTIC SPINDLE	1	ELECTRICAL PARTS		
5322 256 34019	FUSE HOLDER	1	Ordering code	Type	Item Qty.
5322 321 14001	MAINS FUSE	1	TUBES VALVES		
5322 325 60119	CABLE CLIP	1	5322 131 24022	CRT D14-240GH/08	B1 1
5322 455 84034	TEXT PLATE	1	5322 131 90021	STAB.TUBE ZA1004	B5C1,502 2
5322 505 14186	NUT(SPEC)FOR PCIM.UNIT	2	CAPACITORS		
5322 414 34134	KNCR 1CDIA 4AXIS	4	Ordering code	Farad	% Volts Item Qty.
5322 414 14011	KNCR	20	CAPACITORS		
5322 492 64337	RETAINING SPRING	4	5322 125 64009	3P	500 C101 1
5322 414 74015	COVER GREY	4	5322 125 60068	4,5P	500 C102 1
5322 414 34133	KNCR 1CDIA 1/4IN S	1	5322 123 34001	30	10 500 C103 1
5322 414 74028	SKIRT(FOR KNCR)14DIA	1	5322 122 30043	10N	-2n+10n 40 C104 1
5322 414 74031	COVER GREY	1	4822 121 40171	22N	10 400 C105 1
5322 414 74015	COVER GREY	3	4822 122 31203	39	2 500 C106 1
5322 414 34081	KNCR 24DIA 6AXIS	2	5322 125 64009	1,5P	500 C107 1
5322 414 34119	KNCR 14DIA 4AXIS	2	5322 125 64014	3P	500 C108 1
5322 414 74016	COVER BLUE	2	5322 125 64009	3P	500 C109 1
5322 414 34091	KNCR 1CDIA 4AXIS	2	5322 125 60068	4,5P	500 C111 1
5322 414 74028	SKIRT(FOR KNCR)14DIA	1	5322 123 10168	300	10 500 C112 1
5322 414 74015	COVER GREY	2	5322 122 30043	10N	-2n+10n 40 C301,304 4
5322 505 14178	SERRATED NLT(BL6)	1	ADJUST ON TEST		C306,309
5322 535 80523	TERMINAL (BU6)	1	5322 122 30043	10N	-2n+10n 40 C311,318 7
5322 414 34079	KNCR 18-7DIA 6AXIS	2	ADJUST ON TEST		C319,322
5322 414 34091	KNCR 1CDIA 4AXIS	2	10N	-2n+10n 40 C323,331 6	
5322 414 74029	COVER BLUE	2	33MUF	/ 6,3 C322,333 2	
5322 451 34004	PEZZEL	1	5322 122 30043	10N	-2n+10n 40 C335,341 6
5322 480 34046	CONTRAST FILTER GREY	1	10N	-2n+10n 40 C351,354 4	
5322 480 34047	CONTRAST FILTER GREEN	1	ADJUST ON TEST		C356,359
5322 505 14184	PLASTIC NUT BU3	1	10N	-2n+10n 40 C361,368 7	
5322 462 44154	IFG COMP (REAR SIDE)	4	ADJUST ON TEST		C369,372
5322 447 94148	REAR COVER	1	10N	-2n+10n 40 C373,381 6	
5322 447 94146	COVER(COMP)BOTTOM	1	33MUF	/ 6,3 C382,384 3	
5322 447 94147	COVER(COMP)TOP	1	10N	-2n+10n 40 C385,386 2	
5322 458 54043	LEVER(RIGHT)	1	ADJUST ON TEST		C400
5322 458 54045	HANDLE BAR	1	4,7N	10 100 C401 1	
5322 535 74401	LOCKING PIN	2	ADJUST ON TEST		C402,406
5322 492 54155	COMPRESSION SPRING	2	5322 125 50051	18	300 C407 1
5322 458 54044	LEVER(LEFT)	1	4822 122 30129	4,7N	10 100 C408 1
5322 458 54042	INSERT(HANDLE BAR)	1	4822 122 31085	150	2 100 C409 1
5322 405 94073	CURRENT LOOP S1	1	4822 122 30129	4,7N	10 100 C411 1
5322 218 64044	ATTENUATOR COMP	2	4822 122 31085	150	2 100 C412 1
5322 218 64045	SUPPLY FILTER	1	4822 122 30128	4,7N	10 100 C413,414 2
5322 320 44014	DELAY LINE COMP	1	4822 122 30128	4,7N	10 100 C416 1
5322 216 54093	SUPPLY UNIT	1	4822 122 31116	2,2N	10 500 C417 1
5322 216 54094	MT CONVERTER	1	4822 121 41161	100N	10 250 C419,421 2
5322 216 54095	FOCUSING UNIT	1	4822 122 30043	10N	-2n+10n 40 C502 1
5322 216 54096	MAIN TIME BASE	1	4822 122 31058	15	2 100 C503 1
5322 216 54097	FIELD TIME BASE	1	4822 121 41161	100N	10 250 C504,505 2
5322 216 54098	SWITCHING UNIT	1	4822 122 30043	10N	-2n+10n 40 C506 1
5322 216 54099	FOR OUTPUT AMPL.	1	4822 122 31058	15	2 100 C507 1
5322 216 54101	INTERMEDIATE AMPL.	1	4822 121 41161	100N	10 250 C508 1
5322 216 54102	VERT.OUTPUT AMPL.	1	5322 125 50048	3,5P	300 C509 1
5322 218 64046	FHT UNIT	1			
5322 447 94143	CAST ALU FRONT PLATE	1			
5322 255 44088	HOLDER FOR LED	1			
5322 381 14151	REFLECTOR	2			
5322 462 44153	SHOCK ABS.BUFFER	4			
5322 405 94075	SUPPORT	10			
5322 405 94074	CLAMPING PIECE	10			
5322 502 11142	CIL.SCREW RZK M3x20	10			
5322 267 10004	PNC CONNECTOR	2			
5322 267 10004	PNC CONNECTOR	2			

Ordering code	Farad	%	Volts	Item	Qty
4822 122 30128	4.7N	1C	100	C511	1
	10MUF	PRINT		C512	
4822 122 30043	10N	-20+100	40	C513	1
5322 122 30098	3.9N	1C	100	C514	1
4822 122 30043	10N	-20+100	40	C515,516	2
5322 122 30098	3.9N	1C	100	C517	1
4822 122 30043	10N	1C	100	C518,520	2
5322 122 50044	1N	-20+50	3KV	C521	1
5322 122 50001	4.7N	-20+50	3KV	C522	1
4822 121 41152	47N	1C	250	C523	1
4822 122 31211	10C	1C	500	C524	1
4822 121 41161	10CN	1C	250	C526,527	2
5322 121 40123	15N	1C	100N	C528	1
5322 121 40195	33N	1C	160N	C529	1
5322 122 50001	4.7N	-20+50	3KV	C530	1
4822 121 40429	22CN	1C	630	C531	1
4822 122 31174	2.7N	1C	500	C522,533	2
5322 122 50044	1N	-20+50	3KV	C534	1
4822 122 31174	2.7N	1C	500	C536	1
4822 121 41152	47N	1C	250	C537	1
5322 122 30103	22N	-20+100	40	C538,539	2
4822 122 30043	10N	-20+100	40	C541,543	2
4822 122 31198	18	2	500	C601	1
4822 122 31199	22	2	500	C602	1
4822 122 30091	39C	2	100	C607	1
4822 122 30043	10N	-20+100	40	C608	1
4822 122 30128	4.7N	1C	100	C610	1
4822 122 30045	27	2	100	C611	1
4822 122 30043	10N	-20+100	40	C612,614	3
4822 122 30045	27	2	100	C617	1
4822 122 31054	10	2	100	C618,619	2
4822 122 30043	10N	-20+100	40	C620,621	2
5322 122 30103	22N	-20+100	40	C622,623	2
4822 122 30043	10N	-20+100	40	C624,631	6
	SELECT ON TEST			C632,633	
4822 122 30043	10N	-20+100	40	C634,642	6
5322 124 10004	10MUF		20	C643	1
4822 124 20475	10MUF		25	C644,647	2
4822 124 20459	22MUF		10	C646,648	2
4822 124 20459	22MUF		10	C800	1
4822 122 31061	18	2	100	C801	1
5322 122 30103	22N	-20+100	40	C802	1
4822 122 30045	27	2	100	C803	1
4822 122 30043	10N	-20+100	40	C804	1
5322 121 54062	4.3N	1	63	C805	1
5322 121 54076	453	1	250	C806	1
5322 121 40224	4.7MUF	1C	100	C807	1
5322 121 50375	47N	1	63	C808	1
5322 124 14068	22CMUF		10	C809	1
5322 122 30103	22N	-20+100	40	C810	1
4822 121 40079	22CN	1C	100	C811	1
4822 122 30128	4.7N	2	100	C812	1
5322 122 30103	22N	-20+100	40	C813,818	5
	SELECT ON TEST			C816	
4822 124 20475	10MUF		25	C819,822	2
4822 124 20459	22MUF		10	C820,823	3
4822 122 31198	18	2	500	C1001	1
4822 122 31199	22	2	500	C1002	1
4822 122 30091	39C	2	100	C1007	1
4822 122 30043	10N	-20+100	40	C1008	1
4822 122 30128	4.7N	1C	100	C1010	1
4822 122 30045	27	2	100	C1011	1
4822 122 30043	10N	-20+100	40	C1012,14	3
4822 122 30045	27	2	100	C1017	1
4822 122 31054	10	2	100	C1018,19	2
4822 122 30043	10N	-20+100	40	C1021	1
5322 122 30103	22N	-20+100	40	C1022,23	2
4822 122 30043	10N	-20+100	40	C1024,31	6
	SELECT ON TEST			C1032,33	
4822 122 30043	10N	-20+100	40	C1034,41	7
4822 124 20475	10MUF		25	C1044,47	2
4822 124 20459	22MUF		10	C1046,48	2
5322 121 54062	4.3N	1	63	C1200	1
4822 122 31061	18	1	100	C1201	1
5322 121 54076	453	1	250	C1202	1
5322 121 40224	4.7MUF	1C	100	C1203	1
5322 121 50375	47N	1	63	C1204	1
4822 122 30043	10N	-20+100	40	C1206,07	2
	SELECT ON TEST			C1208	
4822 122 31063	22	2	100	C1209	1
4822 122 30043	10N	-20+100	40	C1210	1
4822 122 30045	27	2	100	C1211	1

Ordering code	Farad	%	Volts	Item	Qty.
4822 124 20475	10MUF		25	C1212,14	2
4822 124 20459	22MUF		10	C1213,16	2
4822 122 30043	10N	-20+100	40	C1217	1
	SELECT ON TEST			C1405,08	
4822 122 30043	10N	-20+100	40	C1406,24	14
4822 122 31178	68C	1C	100	C1602	1
4822 122 31085	15C	2	100	C1603	1
4822 122 30043	10N	-20+100	40	C1604	1
4822 124 20589	22CMUF		10	C1606,07	2
5322 122 30027	1N	1C	100	C1608	1
4822 122 31116	2.2N	1C	500	C1701	1
4822 122 31214	C.82P	0.25P	100	C1702	1
5322 124 50048	3.5P		300	C1703	1
5322 122 30103	22N	-20+100	40	C1704	1
4822 121 41161	10CN	1C	250	C1706	1
5322 125 50048	3.5P		300	C1707	1
4822 122 31214	C.82P	0.25P	100	C1708	1
4822 122 31116	2.2N	1C	500	C1709	1
5322 122 30103	22N	-20+100	40	C1711	1
4822 121 41161	10CN	1C	250	C1712	1
5322 122 30103	22N	-20+100	40	C1713	1
4822 121 41152	47N	1C	250	C1714	1
5322 122 30103	22N	-20+100	40	C1716	1
4822 121 41152	47N	1C	250	C1717	1
5322 121 44142	22CN	1C	250	C1801	1
5322 122 44009	2.2N	2C	250	C1802,03	2
5322 121 44142	22CN	1C	250	C1804	1
4822 124 40066	50+50ML		400	C1806,07	2
5322 124 24075	10CMUF		63	C1808,09	2
4822 121 41143	22N	1C	250	C1811	1
4822 124 20581	22CMUF		4	C1812	1
4822 121 41143	22N	1C	250	C1813	1
4822 124 20459	22MUF		10	C1814	1
4822 121 41161	10CN	1C	250	C1816	1
4822 124 20583	1MUF		63	C1817	1
4822 124 20461	47MUF		10	C1818	1
4822 124 20459	22MUF		10	C1819	1
4822 122 31175	1N	1C	100	C1820	1
4822 124 20501	47MUF		63	C1821	1
4822 124 20475	10MUF		25	C1822	1
4822 121 41161	10CN	1C	250	C1823	1
4822 124 20457	47CMUF		6.3	C1824	1
5322 122 30134	10N	-20+50	3KV	C1825	1
4822 121 41161	10CN	1C	250	C1826,29	4
4822 124 20497	15MUF		63	C1831,32	2
4822 124 20485	33MUF		40	C1833,37	4
4822 124 20473	68MUF		16	C1838,42	4
4822 124 20454	15CMUF		6.3	C1843,52	8
4822 124 20468	33MUF		16	C1901	1
5322 121 40233	68CN	1C	100	C1902	1
4822 121 50345	20N	1	63	C1903	1
4822 124 20453	68MUF		6.3	C1904	1
4822 124 20501	47MUF		63	C2001	1
5322 122 50003	2.7N	-20+50	3KV	C2002	1
4822 124 20467	15MUF		16	C2003	1
4822 121 41147	33N	1C	250	C2004	1
	SELECT ON TEST			C2006	
4822 121 40079	22CN	1C	100	C2007	1
	SELECT ON TEST			C2008	
4822 122 20017	22C	2C	5KV	C2018,28	5

Ordering code	Type	Item	Qty
INDEX			
4822 130 30885	COY 24 IFD	GR1,3	3
5322 130 34037	6AV 45	GR1C1	1
5322 130 30613	PAW 62	GR3C1	1
5322 130 30644	PA 182	GR3C2,04	3
5322 130 30759	PZX 79/C5V6 ZENER	GR311	1
5322 130 30613	PAW 62	GR351	1
5322 130 30644	PA 182	GR352,54	3
5322 130 30392	PZY 88/C3V3 ZENER	GR4C1	1
4822 130 30773	PZX 79/C4V7 ZENER	GR4C2	1
5322 130 30613	PAW 62	GR4C3	1
5322 130 30768	PZX 79/C6V8 ZENER	GR4C4	1
5322 130 30613	PAW 62	GR4C6	1
5322 130 30392	PZY 88/C3V3 ZENER	GR4C7	1
5322 130 30759	PZX 79/C5V6 ZENER	GR5C2	1
5322 130 30761	PZX 79/C6V1 ZENER	GR5C3	1

Ordering code	Type	Item	Qty.	Ordering code	Ω	%	Watt	Item	Qty.
5322 130 3C613	PAW 62	GR5C4.06	2	RESISTORS					
5322 130 3C667	BZX 79/C5V1 ZENER	GR5C7	1	5322 1C1 64016	5K	TEFURN1		R1	1
5322 130 3C605	BAX 17	GR5C8.18	1C	5322 1C1 44015	50K	2C	CP20	R2	1
5322 130 34164	PZX 79/C47 ZENER	GR513	1	5322 1C1 24056	1K	2C	CP16	R3	1
5322 130 34037	PAV 45	GR6C1	1	5322 1C1 24056	1K	2C	CP16	R7	1
5322 130 34331	PAV 70	GR6C2	1	5322 1C1 44014	100K	2C	CP16	RE.10	2
5322 130 3C613	PAW 62	GR6C3.04	2	5322 1C1 24047	22K	2C	CP16	R11.12	2
5322 130 3C765	BZX 75/C3V6 STABIST.	GR6C6	1	5322 1C1 4C041	4.7K	2C	CP23	R12.14	2
5322 130 3C613	PAW 62	GR6C1.0H	6	5322 1C1 24046	100K	2C	CP16	R15	1
5322 130 34047	BZX 75/C1V4 STABIST.	GR8C6	1	4822 1C1 2C416	4.7K	2C	CP16	R16	1
5322 130 34037	BAV 45	CR1CC1	1	5322 1C1 24046	100K	2C	CP16	R17	1
5322 130 34331	PAV 70	CR10C2	1	4822 1C1 2C416	4.7K	2C	CP16	R18	1
5322 130 3C613	PAW 62	GR10C3.4	2	5322 1C1 24055	25K	2C	CP16	R19	1
5322 130 3C765	BZX 75/C3V6 STABIST.	CR1CC6	1	4822 1C1 2C417	22K	2C	CP16	R2C.21	2
5322 130 3C613	PAW 62	GR12C1.4	4	5322 1C1 24054	10K	2C	CP16	R22	1
5322 130 3C613	PAW 62	GR14C1.7	6	4822 111 3C069	39	5	CR16	R1C1	1
5322 130 3C424	BAX 12	CR1C61	1	5322 116 54324	92CK	1	MR30	R1C2	1
5322 130 3C767	BZX 79/C5V1 ZENER	CR17C1	1	5322 111 3C074	56	5	CR16	R1C3	1
5322 130 34328	BZX 79/R30 ZENER	CR17C2	1	5322 116 5C821	88.9K	1	MR25	R1C4	1
5322 130 34173	BZX 79/R5V6 ZENER	CR17C3	1	4822 111 3C176	18	5	CR16	R1C6	1
5322 130 34145	BZX 79/R30 ZENER	CR17C4	1	5322 116 54726	20CK	1	MR25	R1C7	1
5322 130 34329	PZX 79/R43 ZENER	CR17C6	1	4822 111 3C067	33	5	CR16	R1C8	1
5322 130 3C767	BZX 79/C5V1 ZENER	CR17C7	1	4822 111 3C309	56C	5	CR16	R1C9	1
5322 130 3C256	BA 148	GR18C1.9	8	4822 111 3C309	56C	5	CR16	R111	1
4822 130 3C817	BYX 55/6C0	CR1811	1	5322 116 54323	80CK	1	MR30	R112	1
5322 130 3C774	BZX 79/C10 ZENER	CR1812	1	4822 111 3C069	39	5	CR16	R113	1
5322 130 34034	BZX 61/C75 ZENER	CR1813	1	5322 116 54209	992K	1	MR30	R114	1
5322 130 3C786	BZX 61/C33 ZENER	CR1814	1	5322 111 3C074	56	5	CR16	R116	1
5322 130 3C424	BAX 12	CR1816	1	5322 116 5C914	8.0CK	1	MR25	R117	1
5322 130 34047	BZX 75/C1V4 STABIST.	CR1817	1	5322 116 5C592	442	1	MR25	R11E.19	2
5322 130 3C613	PAW 62	CR1818	1	5322 1C1 14069	22K	2C	C.5	R3C1	1
5322 130 34049	BZX 75/C2V1 STABIST.	CR1819	1	5322 116 54608	7.5K	1	MR25	R3C2	1
5322 130 3C256	BA 148	GR1824.7	3	5322 116 5C586	1.54K	1	MR25	R3C3	1
5322 130 34186	BYX 10	CR1828	1	5322 1C1 14047	47C	2C	C.5	R3C4	1
5322 130 34165	BZX 79/C62 ZENER	CR1829	1	5322 116 54571	1.96K	1	MR25	R3C6	1
5322 130 3C256	BA 148	GR1831.3	3	5322 116 5C524	3.01K	1	MR25	R3C7	1
5322 130 3C605	BAX 17	GR1834.6	2	5322 116 54585	3.48K	1	MR25	R3C8	1
5322 130 3C424	BAX 12	GR1837.46	8	5322 116 54532	649	1	MR25	R3C9	1
5322 130 3C256	BA 148	GR1847.56	8	5322 1C1 14047	47C	2C	C.5	R311	1
5322 130 3C759	BZX 79/C5V6 ZENER	CR19C1	1	5322 116 5C747	1K	1	MR25	R312	1
5322 130 34136	PV 187	G2C01.23	1C	5322 116 54619	10K	1	MR25	R313	1
5322 130 3C256	BA 148	CR2CC3	1						

Ordering code	Description	Item	Qty.
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INTEGRATED CIRCUITS

5322 2C9 84424	IMPEDANCE CONVERTER	IC1C1	1
5322 2C9 84427	TRIGGER AMPLIFIER	IC3C1	1
5322 2C9 84425	LEVEL SHIFTER	IC3C2	1
5322 2C9 84112	TRA 221 CP.AMP.	IC3C3	1
5322 2C9 84426	CONT.AMPL.CONTROL	IC3C4	1
5322 2C9 84428	ELECTR.SWITCH	IC3C6	1
5322 2C9 84427	TRIGGER AMPLIFIER	IC351	1
5322 2C9 84425	LEVEL SHIFTER	IC352	1
5322 2C9 84112	TRA 221 CP.AMP.	IC353	1
5322 2C9 84426	CONT.AMPL.CONTROL	IC354	1
5322 2C9 84483	DELAY-LINE CORP.AMP.	IC4C1	1
5322 2C9 84484	FINAL AMPLIFIER	IC4C2.03	2
5322 2C9 84485	PULSE-FORMER	IC4C1	1
5322 2C9 84485	PULSE-FORMER	IC10C1	1
5322 2C9 84178	SN 740CN	IC16C1	1
5322 2C9 84414	SN 7426N	IC16C2	1
5322 2C9 84166	SN 7472N	IC16C3	1
5322 2C9 8C245	THA 281 VOLT.REG.	IC18C1	1
5322 2C9 8C068	TAA 521 CP.AMP	IC19C1	1

5322 116 5C747	1K	1	MR25	R314R316	
5322 1C1 14069	22K	2C	C.5	R317R319	2
5322 116 54585	3.48K	1	MR25	R318	1
5322 116 54532	649	1	MR25	R321	1
				R322	1
				R323	
5322 116 54469	10C	1	MR25	R324	1
5322 116 54472	105	1	MR25	R326	1
5322 116 5C414	2.87K	1	MR25	R327	1
5322 116 54469	10C	1	MR25	R328	1
5322 116 5C414	2.87K	1	MR25	R329	1
5322 116 5C669	205	1	MR25	R331	1
5322 116 5C747	1K	1	MR25	R332	1
5322 1C1 14069	22K	2C	C.5	R333	1
5322 116 54585	3.48K	1	MR25	R334	1
5322 116 54589	3.83K	1	MR25	R336	1
5322 116 5C747	1K	1	MR25	R337	1
5322 116 5C5C9	4.87K	1	MR25	R338R339	2
5322 116 5C747	1K	1	MR25	R341R342	2
5322 116 5C491	22.6	1	MR25	R343R344	2
5322 116 54469	10C	1	MR25	R345	1
5322 116 5C459	422	1	MR25	R346	1
5322 116 5C583	5.9K	1	MR25	R347	1
5322 116 54608	7.5K	1	MR25	R348	1
5322 116 5C728	1.87K	1	MR25	R349	1
5322 1C1 14069	22K	2C	C.5	R351	1
5322 116 54608	7.5K	1	MR25	R352	1
5322 116 5C586	1.54K	1	MR25	R353	1
5322 1C1 14047	47C	2C	C.5	R354	1
5322 116 54571	1.96	1	MR25	R356	1
5322 116 5C524	3.01K	1	MR25	R357	1
5322 116 54585	3.48K	1	MR25	R358	1
5322 116 54532	649	1	MR25	R359	1
5322 1C1 14047	47C	2C	C.5	R361	1
5322 116 5C747	1K	1	MR25	R362	1
5322 116 54619	10K	1	MR25	R363	1

Ordering code	Ω	%	Watt	Item	Qty.	Ordering code	Ω	%	Watt	Item	Qty.
				SELECT ON TEST							
5322 116 50747	1K	1	MR25	R367	1	5322 116 50557	46.4K	1	MR25	R556	1
5322 101 14069	22K	20	C.5	R368	1	5322 116 50536	46.4	1	MR25	R557	1
5322 116 50747	1K	1	MR25	R369	1	5322 116 50557	46.4K	1	MR25	R558	1
5322 116 54585	3.48K	1	MR25	R371	1	5322 116 54623	11K	1	MR25	R559	1
5322 116 54532	649	1	MR25	R372	1	5322 116 54743	301K	1	MR25	R560	1
				SELECT ON TEST		5322 116 54619	10K	1	MR25	R561	1
5322 116 54469	100	1	MR25	R373	1	5322 116 54627	13.3K	1	MR25	R562	1
5322 116 54472	105	1	MR25	R374	1	5322 116 50414	2.87K	1	MR25	R563	1
5322 116 50414	2.87K	1	MR25	R376	1	4822 110 63187	1M	5	CR25	R564	1
5322 116 54469	100	1	MR25	R377	1	5322 116 50747	1K	1	MR25	R565	1
5322 116 50414	2.87K	1	MR25	R378	1	4822 110 63187	1M	5	CR25	R566	1
5322 116 50669	205	1	MR25	R379	1	4822 110 63161	100K	5	CR25	R567	1
5322 116 50747	1K	1	MR25	R381	1	5322 101 14094	1M	20	C.5	R568	1
5322 101 14069	22K	20	C.5	R382	1	4822 110 63187	1M	5	CR25	R569	2
5322 116 54585	3.48K	1	MR25	R383	1	5322 116 54676	56.2K	1	MR25	R572	1
5322 116 54589	3.83K	1	MR25	R384	1	4822 110 42223	22M	5	VR37	R573	1
5322 116 50747	1K	1	MR25	R386	1				SELECT ON TEST		
5322 116 505C9	4.87K	1	MR25	R387	1	4822 110 63161	100K	5	CR25	R574	1
5322 116 50747	1K	1	MR25	R388	1	4822 110 63196	2.2M	10	CR25	R577	2
5322 116 50491	22.6	1	MR25	R389	2	5322 101 14094	1M	20	C.5	R579	1
5322 116 54442	51.1	1	MR25	R391	2	5322 116 50747	1K	1	MR25	R580	1
				SELECT ON TEST		5322 116 54619	10K	1	MR25	R581	1
5322 100 10138	100	20	C.75	R403	1	5322 116 54701	11CK	1	MR25	R582	2
5322 101 14056	47K	20	C.75	R408	1	5322 116 54674	53.6K	1	MR25	R584	1
5322 116 50767	2.15K	1	MR25	R409	2	5322 116 50491	22.6	1	MR25	R585	1
5322 116 54696	100K	1	MR25	R411	1	5322 116 54674	53.6K	1	MR25	R586	1
5322 116 50767	2.15K	1	MR25	R412	2	5322 101 14048	47K	20	C.5	R587	3
4822 111 30347	10	5	CR16	R414	1	5322 116 54469	100	1	MR25	R591	1
5322 116 64005	200	5	5	R417	1	5322 116 54492	178	1	MR25	R592	1
5322 116 54469	100	1	MR25	R418	1	5322 111 30365	51	5	CR16	R600	1
5322 116 54534	681	1	MR25	R395	1	5322 116 54195	825K	1	MR30	R601	1
5322 101 14093	50	20	C.5	R422	1	5322 116 54721	178K	1	MR25	R602	1
5322 116 54466	90.9	1	MR25	R423	1	4822 110 63207	5.6M	10	CR25	R606	2
5322 116 64005	200	5	5	R424	2	4822 111 30324	100	5	CR16	R608	1
5322 111 44153	15	5	CR16	R427	1	5322 111 30396	22	5	CR16	R609	1
5322 116 50664	2.05K	1	MR25	R428	1	5322 116 54558	8.25K	1	MR25	R611	1
5322 116 54603	6.49K	1	MR25	R429	1	5322 116 54515	348	1	MR25	R612	1
5322 100 10141	10K	20	C.75	R430	1	5322 116 54541	825	1	MR25	R613	1
5322 116 50621	536	1	MR25	R432	1	5322 116 50506	154	1	MR25	R614	1
5322 116 54536	750	1	MR25	R433	1	5322 116 54619	10K	1	MR25	R616	1
5322 116 54565	1.62K	1	MR25	R434	1	5322 116 50481	22.6K	1	MR25	R617	1
5322 116 54442	51.1	1	MR25	R436	1	5322 116 54529	619	1	MR25	R618	1
5322 116 54567	1.69K	1	MR25	R506	2	4822 111 30348	27	5	CR16	R619	1
5322 116 50557	46.4K	1	MR25	R508	1	5322 111 30396	22	5	CR16	R621	1
5322 116 54743	301K	1	MR25	R509	1	4822 111 30067	33	5	CR16	R622	1
5322 116 54623	11K	1	MR25	R511	1	5322 116 54459	75	1	MR25	R623	1
5322 116 50779	1.33K	1	MR25	R512	1	4822 111 30067	33	5	CR16	R624	1
5322 116 54005	3.32K	1	MR25	R513	1	5322 116 54469	100	1	MR25	R626	1
5322 116 50728	1.87K	1	MR25	R514	2	5322 116 54629	619	1	MR25	R627	1
5322 116 54661	3.48K	1	MR25	R517	1	5322 116 54534	681	1	MR25	R628	1
5322 116 54536	750	1	MR25	R518	1	5322 116 54426	121	1	MR25	R629	1
4822 110 63036	2.2	5	CR25	R519	1	5322 101 14011	100	20	C.5	R631	1
5322 116 54689	82.5K	1	MR25	R520	1	4822 111 30348	27	5	CR16	R633	1
5322 116 50492	46.4	1	MR25	R521	1	5322 116 54469	100	1	MR25	R634	1
5322 116 54567	1.69K	1	MR25	R522	1	5322 111 30074	56	5	CR16	R635	1
5322 116 54538	787	1	MR25	R523	1	5322 100 10113	10K	20	C.5	R636	1
5322 116 50492	46.4	1	MR25	R524	1	5322 116 50524	3.01K	1	MR25	R637	1
5322 116 54497	226	1	MR25	R526	1	4822 111 30067	33	5	CR16	R638	1
5322 116 50492	46.4	1	MR25	R527	1	5322 116 54534	681	1	MR25	R639	1
5322 116 50536	464	1	MR25	R528	1	5322 116 54529	619	1	MR25	R641	1
5322 116 54617	9.53K	1	MR25	R529	1	5322 116 54469	100	1	MR25	R642	1
5322 116 54665	40.2K	1	MR25	R531	1	4822 111 30067	33	5	CR16	R643	1
5322 116 54617	9.53K	1	MR25	R532	1	5322 116 50524	3.01K	1	MR25	R644	1
5322 116 50559	27.4K	1	MR25	R533	1	5322 111 30074	56	5	CR16	R645	1
5322 116 50608	6.19K	1	MR25	R534	1	5322 116 50524	3.01K	1	MR25	R646	1
5322 116 54005	3.32K	1	MR25	R536	1	4822 111 30348	27	5	CR16	R647	1
5322 116 54623	11K	1	MR25	R537	1	4822 111 30067	33	5	CR16	R648	1
5322 101 14069	22K	20	C.5	R538	1	5322 116 54469	100	1	MR25	R649	1
5322 116 50536	464	1	MR25	R539	1	5322 111 30074	56	5	CR16	R650	1
5322 116 54689	82.5K	1	MR25	R540	1	5322 116 54529	619	1	MR25	R651	1
5322 116 50536	464	1	MR25	R541	1	4822 111 30067	33	5	CR16	R652	1
5322 116 54623	11K	1	MR25	R542	1	5322 116 54534	681	1	MR25	R653	1
5322 116 50557	46.4K	1	MR25	R543	1	5322 116 50524	3.01K	1	MR25	R654	1
5322 116 54627	13.3K	1	MR25	R544	1	5322 111 30074	56	5	CR16	R655	1
5322 101 14069	22K	20	C.5	R546	1	5322 100 10113	10K	20	C.5	R656	1
5322 116 54576	2.37K	1	MR25	R547	1	5322 116 50506	154	1	MR25	R657	1
5322 116 50608	6.19K	1	MR25	R548	1	4822 111 30348	27	5	CR16	R658	1
5322 116 54005	3.32K	1	MR25	R549	1	5322 116 50524	3.01K	1	MR25	R659	1
5322 116 54623	11K	1	MR25	R551	1	4822 111 30067	33	5	CR16	R671	1
5322 116 54689	82.5K	1	MR25	R552	1	5322 116 54469	100	1	MR25	R672	1
5322 116 54623	11K	1	MR25	R553	1	5322 116 54529	619	1	MR25	R673	1
				R554	1	4822 111 30067	33	5	CR16	R674	1

Ordering code	Ω	%	Watt	Item	Qty.	Ordering code	Ω	%	Watt	Item	Qty.
5322 116 54534	681	1	MR25	R676	1	5322 116 54619	10K	1	MR25	R817	1
5322 116 50491	22*6	1	MR25	R677	1	5322 116 54565	1*62K	1	MR25	R818	1
5322 116 50524	3*01K	1	MR25	R678	1	5322 116 54442	5*1	1	MR25	R819	1
5322 116 54696	100K	1	MR25	R679	1	5322 116 54543	866	1	MR25	R821	1
5322 116 50524	3*01K	1	MR25	R681	1	5322 116 50491	22*6	1	MR25	R822	2
5322 116 54541	825	1	MR25	R682	1	5322 116 54595	5*11K	1	MR25	R824	1
5322 116 50557	46*4K	1	MR25	R683	1	4822 111 30067	33	5	CR16	R826	1
5322 116 54011	5*62K	1	MR25	R684	1	5322 116 54619	10K	1	MR25	R827	1
5322 116 54696	100K	1	MR25	R686	1	5322 116 54608	7*5K	1	MR25	R828	1
5322 116 50826	1*78K	1	MR25	R687	1	5322 116 50664	2*05K	1	MR25	R829	1
5322 116 50767	2*15K	1	MR25	R688	1	5322 116 50636	2*74K	1	MR25	R831	1
5322 116 50747	1K	1	MR25	R689	1	5322 100 10114	4*7K	20	C*5	R834	1
5322 116 50484	4*64K	1	MR25	R692	1	5322 116 50481	22*6K	1	MR25	R836	1
5322 116 54619	10K	1	MR25	R693	1	5322 116 54632	16*7K	1	MR25	R837	1
5322 116 50747	1K	1	MR25	R694	1	5322 116 54653	28*7K	1	MR25	R838	1
5322 116 50826	1*78K	1	MR25	R696	1	5322 116 54479	127	1	MR25	R839	1
5322 116 50767	2*15K	1	MR25	R697	1	5322 116 50474	42*2K	1	MR25	R841	1
5322 116 50524	3*01K	1	MR25	R698	1	5322 116 54648	26*9K	1	MR25	R842	1
5322 116 54541	825	1	MR25	R699	1	5322 116 50451	21*5K	1	MR25	R843	1
5322 116 54529	619	1	MR25	R701	1	5322 116 50675	2*26K	1	MR25	R844	1
5322 116 54536	750	1	MR25	R702	1	5322 116 50457	215	1	MR25	R846	1
5322 116 50842	1*1K	1	MR25	R703	1	5322 116 50414	2*87K	1	MR25	R847	1
5322 111 30396	22	5	CR16	R704	1	5322 116 50509	4*87K	1	MR25	R848	1
4822 111 30067	33	5	CR16	R706	1	5322 116 54562	1*4K	1	MR25	R849	1
5322 116 54529	619	1	MR25	R707	1	5322 116 54009	562	1	MR25	R850	1
5322 116 50572	12*1K	1	MR25	R708	1	5322 116 54519	402	1	MR25	R851	1
5322 100 10113	10K	20	C*5	R709	1	5322 116 54532	649	1	MR25	R852	1
5322 116 50747	1K	1	MR25	R711	1	5322 116 50826	1*78K	1	MR25	R853	1
5322 101 14047	470	20	C*5	R712	1	5322 116 50491	22*6	1	MR25	R854	1
5322 116 54619	10K	1	MR25	R713	1	5322 116 50559	27*4K	1	MR25	R855	1
5322 116 50586	1*54	1	MR25	R714	1	5322 116 54009	562	1	MR25	R856	2
5322 116 50484	4*64K	1	MR25	R716	1	5322 116 50559	27*4K	1	MR25	R858	2
5322 116 50747	1K	1	MR25	R717	1	5322 116 50675	2*26K	1	MR25	R860	3
5322 116 50586	1*54K	1	MR25	R718	1	5322 116 50636	2*74K	1	MR25	R863	3
5322 116 54587	3*65K	1	MR25	R719	1	5322 116 54192	5*11	1	MR25	R866	1
5322 116 54529	619	1	MR25	R721	1	5322 116 50491	22*6	1	MR25	R867	1
5322 116 50635	1*47K	1	MR25	R722	1	5322 116 54641	19*6K	1	MR25	R868	1
5322 116 50747	1K	1	MR25	R723	1	5322 116 54585	3*48K	1	MR25	R869	1
5322 116 54529	619	1	MR25	R724	1	5322 116 54005	3*32K	1	MR25	R870	1
5322 116 54536	750	1	MR25	R726	1	5322 116 54661	34*8K	1	MR25	R871	1
5322 111 30396	22	5	CR16	R727	1	5322 116 50726	36*5K	1	MR25	R872	1
4822 111 30067	33	5	CR16	R728	1	5322 116 50491	22*6	1	MR25	R873	2
5322 116 50842	1*1K	1	MR25	R729	1	4822 111 30245	47	5	CR16	R876	1
5322 111 30396	22	5	CR16	R731	1	4822 111 30352	82	5	CR16	R877	1
4822 111 30352	82	5	CR16	R732	1	5322 111 30279	33K	5	CR16	R878	1
5322 111 30396	22	5	CR16	R733	1	5322 116 54655	30*1K	1	MR25	R881	1
5322 116 54585	3*48K	1	MR25	R734	1	5322 116 54619	10K	1	MR25	R889	1
5322 116 54592	4*02K	1	MR25	R736	1	5322 116 50508	487	1	MR25	R891	1
5322 101 14069	22K	20	C*5	R737	1	5322 116 54637	17*8K	1	MR25	R893	1
5322 116 50479	15*4K	1	MR25	R738	1	5322 116 50572	12*1K	1	MR25	R894	1
5322 116 50826	1*78K	1	MR25	R739	1	5322 116 54689	82*5K	1	MR25	R896	1
5322 116 54558	8*25K	1	MR25	R741	1	5322 116 54608	7*5K	1	MR25	R897	1
5322 116 50747	1K	1	MR25	R742	1	5322 116 50767	2*15K	1	MR25	R898	1
5322 116 54469	100	1	MR25	R743	1	5322 116 54643	20*6K	1	MR25	R899	1
5322 116 54592	4*02K	1	MR25	R744	1	4822 110 63036	2*2	5	CR25	R901	4
4822 111 30176	18	5	CR16	R746	1	5322 116 54902	876K	1/4	MR54C	R921	1
5322 116 54515	348	1	MR25	R748	1	5322 116 54901	887K	1/4	MR54C	R922	1
4822 111 30176	18	5	CR16	R751	2	5322 116 54896	354K	1/4	MR34C	R923	1
4822 111 30352	82	5	CR16	R756	1	5322 116 54899	176K	1/4	MR34C	R924	1
5322 116 50572	12*1K	1	MR25	R757	1	5322 116 54897	87*6K	1/4	MR24C	R926	1
5322 116 50524	3*01K	1	MR25	R758	1	5322 116 54895	34*6K	1/4	MR24C	R927	1
5322 116 50484	4*64K	1	MR25	R759	1	5322 116 54894	16*8K	1/4	MR24C	R928	1
5322 116 54508	301	1	MR25	R761	1	5322 116 50807	7*96K	1/4	MR24C	R929	1
5322 116 54565	1*62K	1	MR25	R762	1	5322 116 50867	2*67K	1/4	MR24C	R931	1
4822 111 30272	680	5	CR16	R763	1	5322 116 54898	887	1/4	MR24C	R932	1
4822 111 30324	100	5	CR16	R764	2	5322 111 30365	51	5	CR16	R1000	1
4822 111 30272	680	5	CR16	R766	1	5322 116 54195	825K	1	MR30	R1001	1
4822 110 63036	2*2	5	CR25	R767	4	5322 116 54721	178K	1	MR25	R1002	1
5322 111 44158	15	5	CR16	R801	1	4822 110 63207	5*6M	10	CR25	R1006	2
5322 116 54446	56*2	1	MR25	R802	1	4822 111 30324	100	5	CR16	R1008	1
5322 116 54508	301	1	MR25	R803	1	5322 111 30396	22	5	CR16	R1009	1
5322 116 50675	2*26K	1	MR25	R804	1	5322 116 54541	825	1	MR25	R1013	1
5322 116 54624	11*5K	1	MR25	R805	1	5322 116 50506	154	1	MR25	R1014	1
5322 100 10113	10K	20	C*5	R806	1	5322 116 54529	619	1	MR25	R1018	1
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5322 116 50414	2*87K	1	MR25	R808	1	5322 111 30396	22	5	CR16	R1021	1
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5322 116 54511	316	1	MR25	R810	1	5322 116 54459	75	1	MR25	R1023	1
5322 116 54587	3*65K	1	MR25	R811	1	4822 111 30067	33	5	CR16	R1024	1
5322 116 54442	5*1	1	MR25	R812	1	5322 116 54469	100	1	MR25	R1026	1
5322 116 50583	6*9K	1	MR25	R813	1	5322 116 54529	619	1	MR25	R1027	1
5322 116 54442	5*1	1	MR25	R814	1	5322 116 54534	681	1	MR25	R1028	1
				R816		5322 116 54426	121	1	MR25	R1029	1
SELECT ON TEST											

Ordering code	Type	Item	Qty.
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5322 130 44127	2N2894A	TS17C6	1
5322 130 44127	2N2894A	TA17C7	1
5322 130 4C672	BFK 44	TS17C8	1
4822 130 4C9C8	BF 336	TS17C9	1
5322 130 44105	RDY 93	TS18C1	1
5322 130 4C482	BRV 39 THYRISTOR	TS18C2	1
4822 130 4C858	BU 126	TS18C3	1
4822 130 4C858	BU 126	TS18C4	1
5322 130 44019	BSX 60	TS18C6	1
5322 130 4C417	BSX 20	TS18C7	1
5322 130 4C482	BRV 39 THYRISTOR	TS18C8	1
	CNY 23 PHOTO-CELLER	TS18C9	1
4822 130 4C973	BC 557	TS20C1	1
4822 130 4C965	BC 547	TS20C2	1
4822 130 4C959	BC 547E	TS20C3	1
5322 130 4C714	BSK 66	TS20C4	1

5322 130 44696 new po

5322 130 44357
new

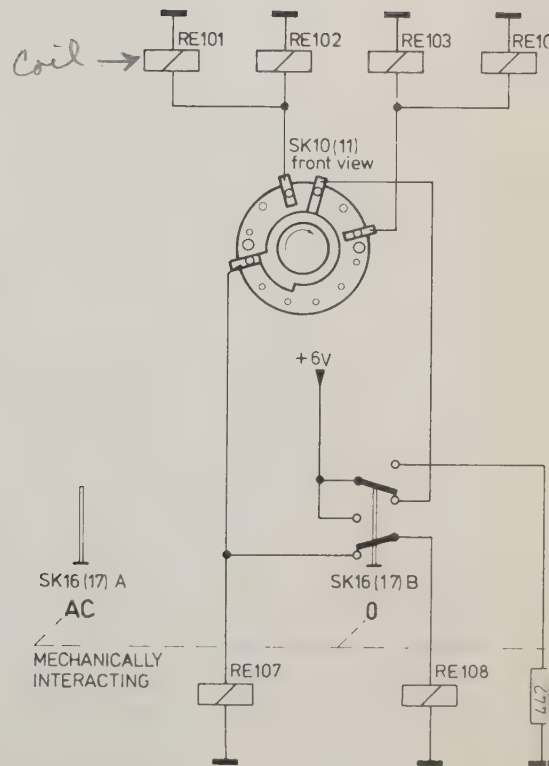
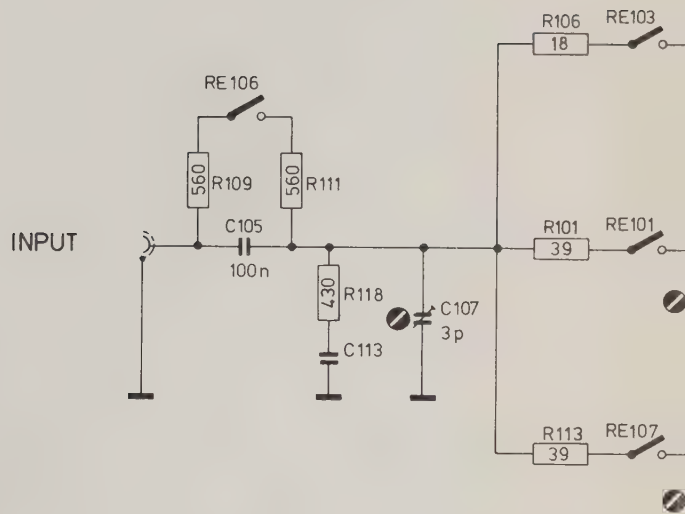
4822 130 41451

Ordering code	Description	Item	Qty.
INDUCTORS			
5322 466 14121	DEFLAYLINE	L301	1
5322 281 64154	COIL 144MH	L391	1
5322 466 14119	FILTER (COMP)	L4C1,4C9	8
5322 466 14121	COIL (COMP)	L411,412	2
5322 150 14013	CRT CORR. COIL	L501	1
5322 281 64154	COIL 144MH	L16C1	1
5322 158 14026	COIL (COMP)	L16C1,02	2
5322 281 64154	COIL 144MH	L18C3	1
5322 158 14086	COIL 22MH	L18C4	1
5322 158 1C052	COIL	L18C6	1
5322 281 64154	COIL 144MH	L18C7	1
5322 158 1C052	COIL	L18C8	1
5322 281 64154	COIL 144MH	L18C9	1
5322 158 1C052	COIL	L1811	1
5322 281 64154	COIL 144MH	L1812	1
5322 158 1C052	COIL	L1813	1
5322 281 64154	COIL 144MH	L1814	1
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5322 158 1C052	COIL	L1818	1
5322 281 64154	COIL 144MH	L1819	1
5322 158 1C052	COIL	L1821	1
5322 281 64154	COIL 144MH	L1822	1
5322 158 1C052	COIL	L1823	1
5322 281 64154	COIL 144MH	L1824	1
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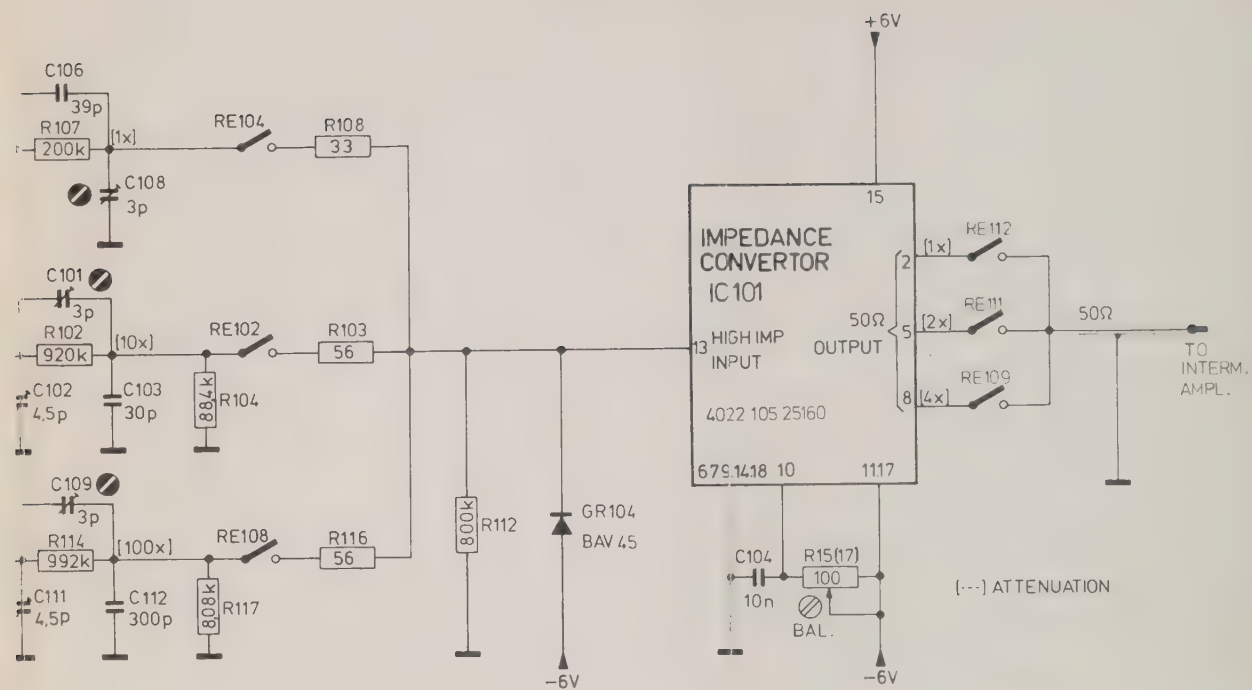
Ordering code	Type	Item	Qty.
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LAMPS

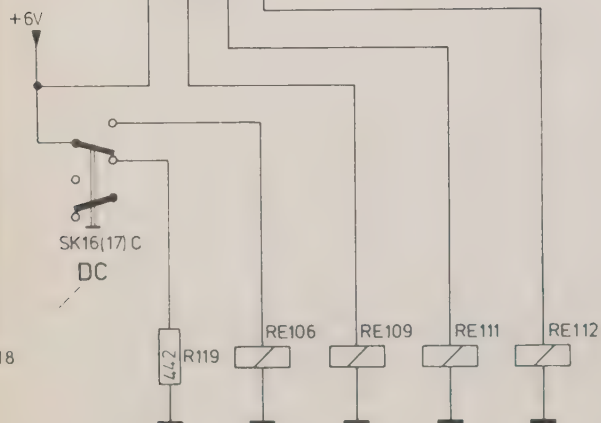
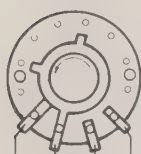
5322 134 44017	LAMP TYPE 394	LA1,2	2
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SK10 (11) DRAW
SK16(17) DRAW



SK10 (11)
rear view



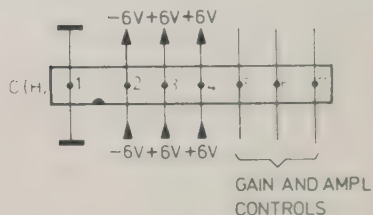
POSITIONS
0
V/cm SWITCH
SK10 (11)

	RE101	RE102	RE103	RE104	RE107	RE108	RE109	RE111	RE112
2 V									
1 V									
,5 V									
,2 V	●	●							
,1 V	●	●							
50 mV	●	●							
20 mV			●	●					
10 mV			●	●					
5 mV			●	●					

(● = RELAY CONTACT
CLOSED)

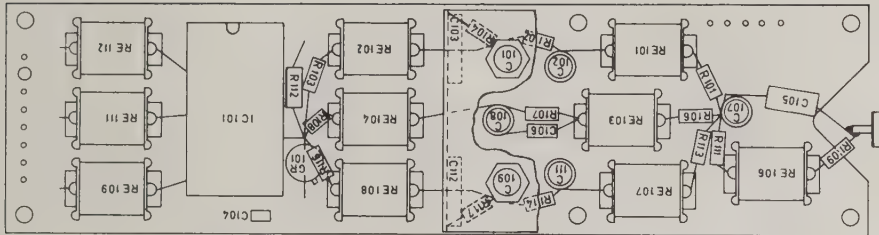
AC-0-DC switch in position 0 overrides
this diagram: RE 108 closed
RE 101-107 open

RELAYS ←

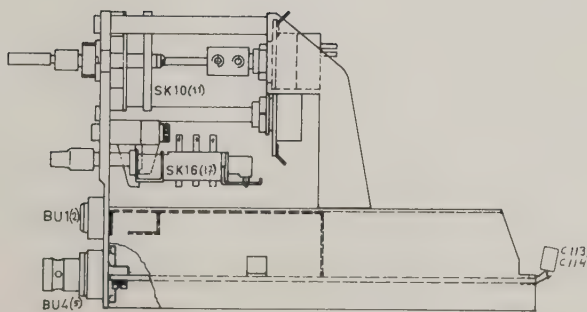
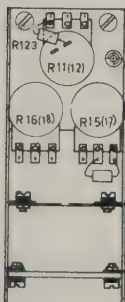


MA 8481

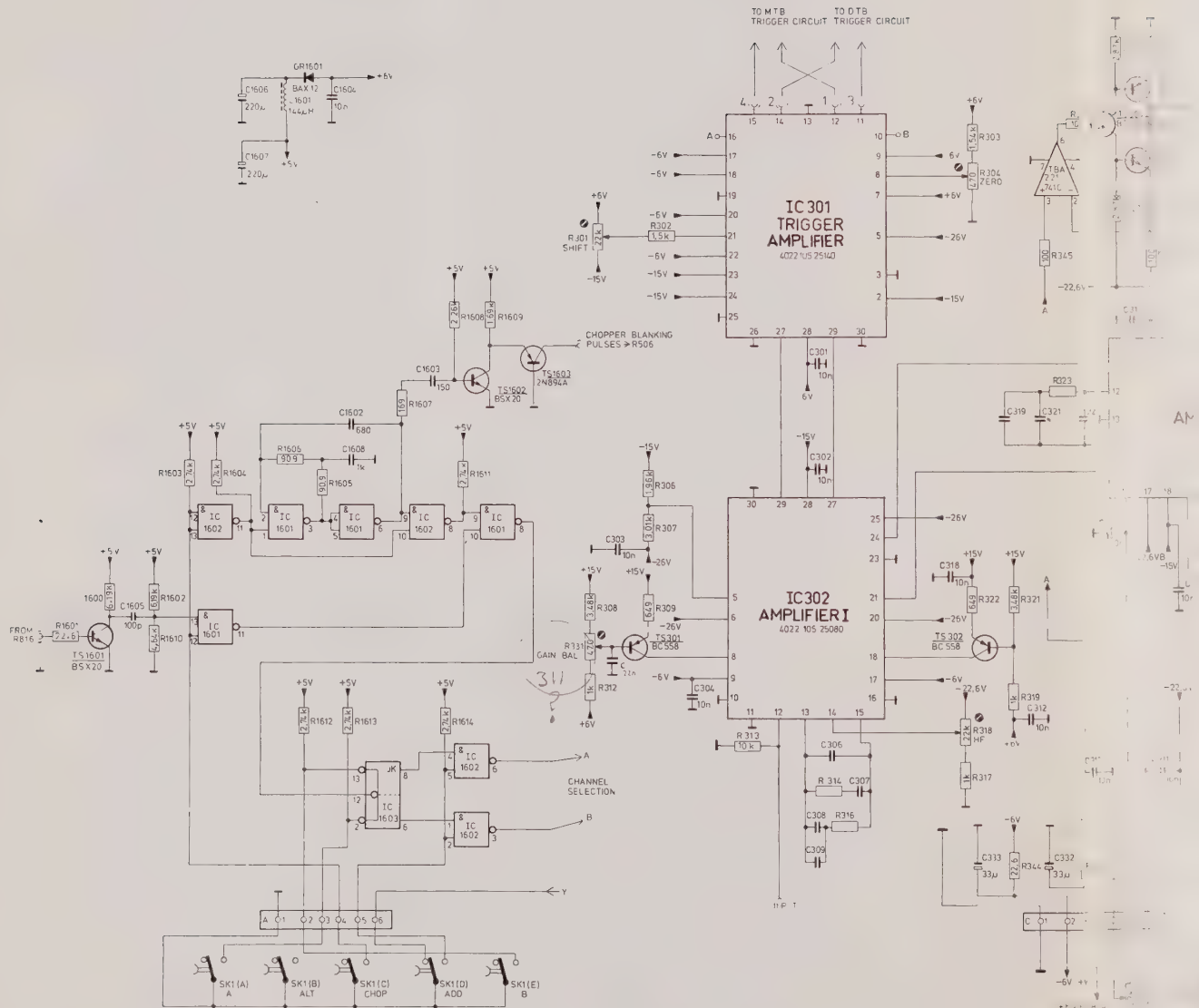
Y Attenuator



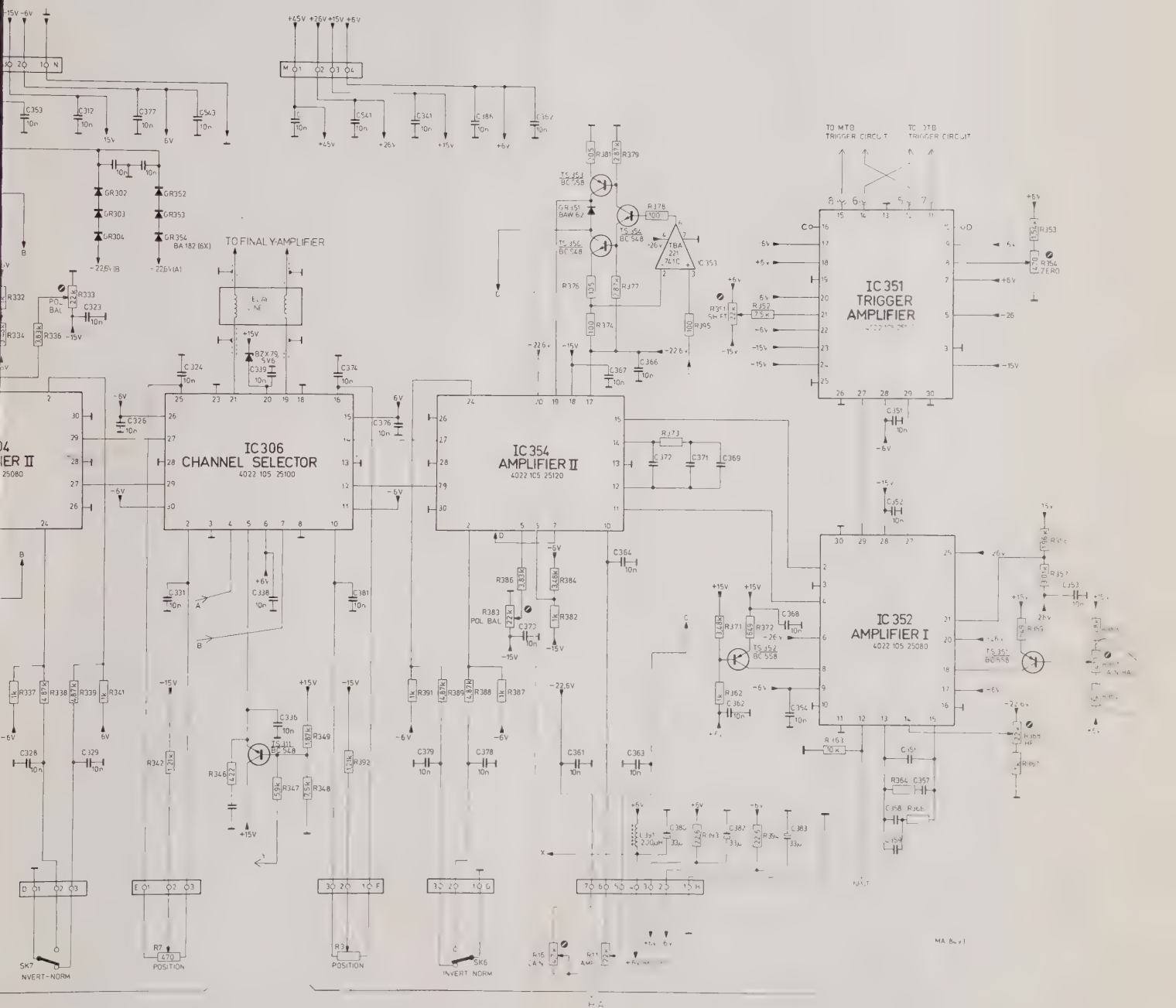
Y Attenuator, printed-wiring board (2)



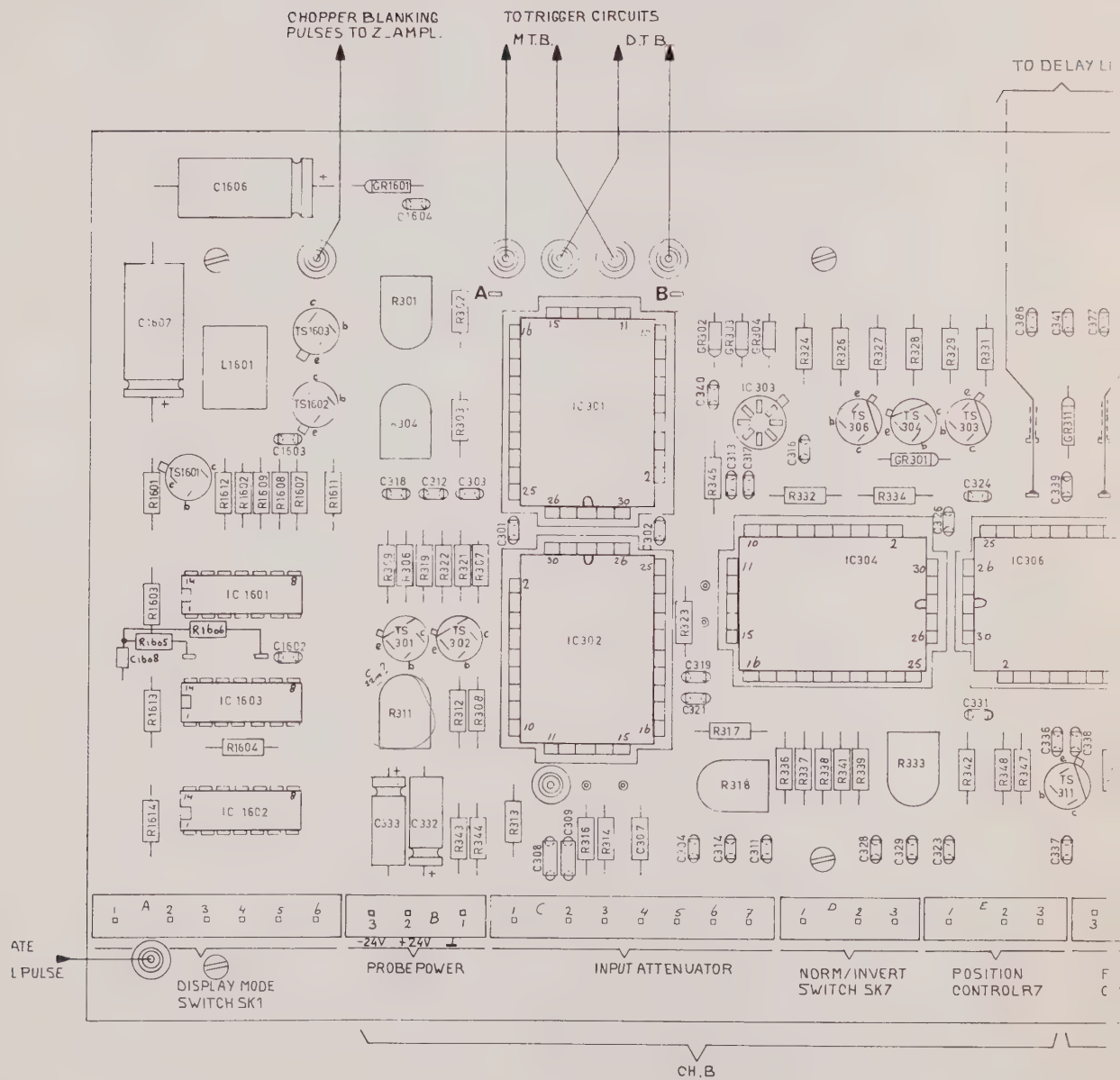
Y Attenuator, assy (2)

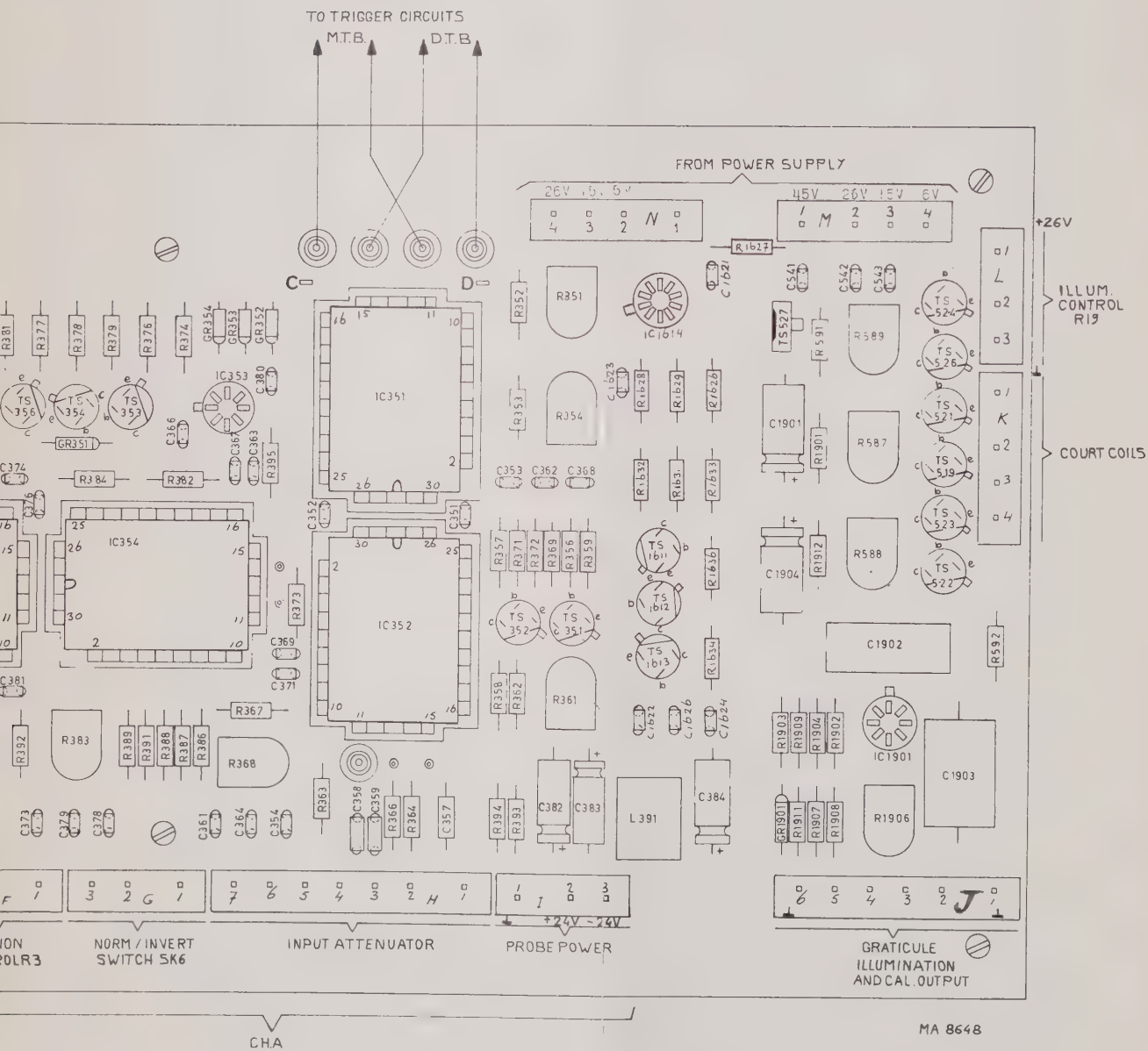


IC 1601 = SN 7400N + FJH131
 IC 1602 = SN 7426N + 1703AN1 + FJH301
 IC 1603 = SN 7472N + FJ111



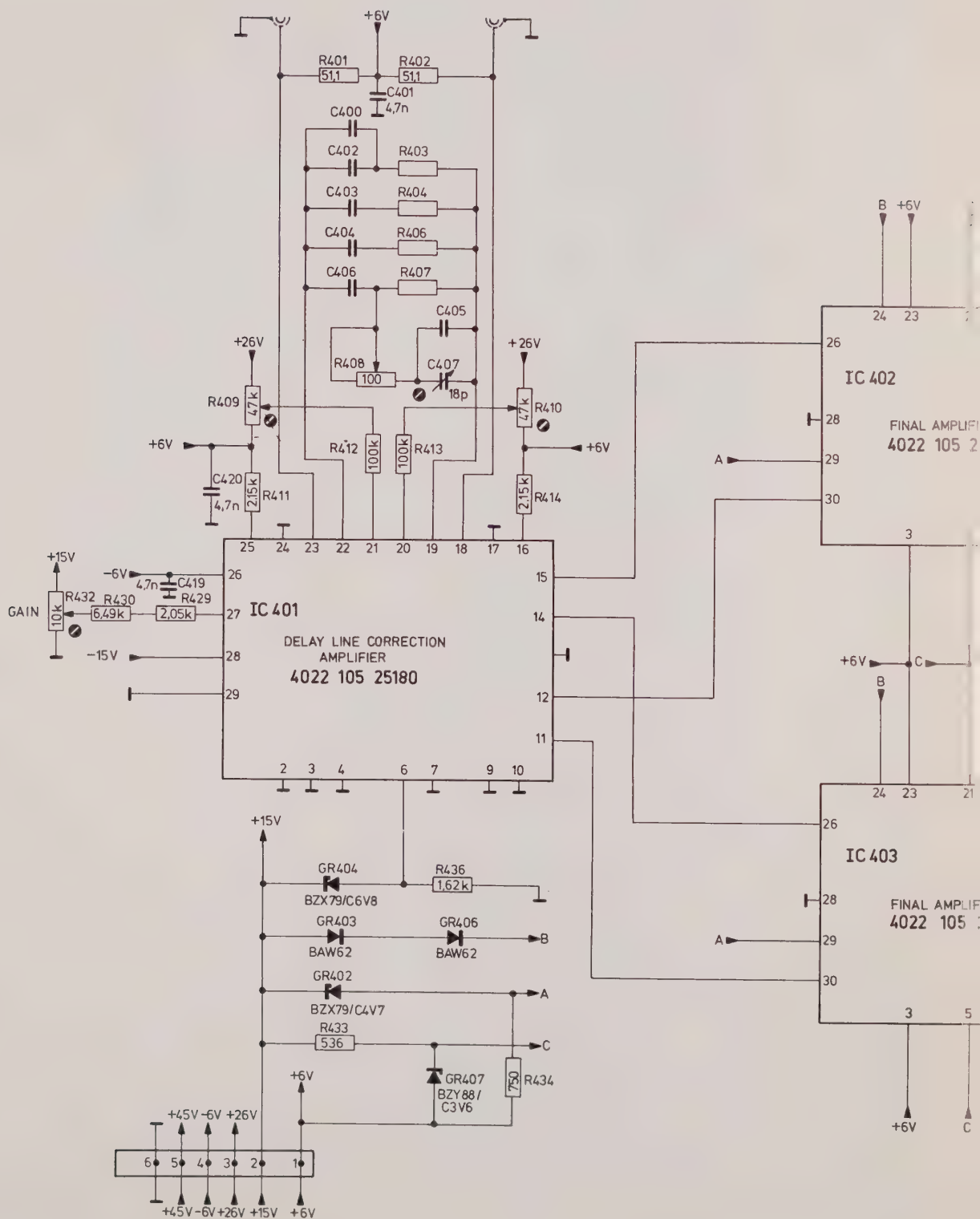
Intermediate amplifier (Y) ③

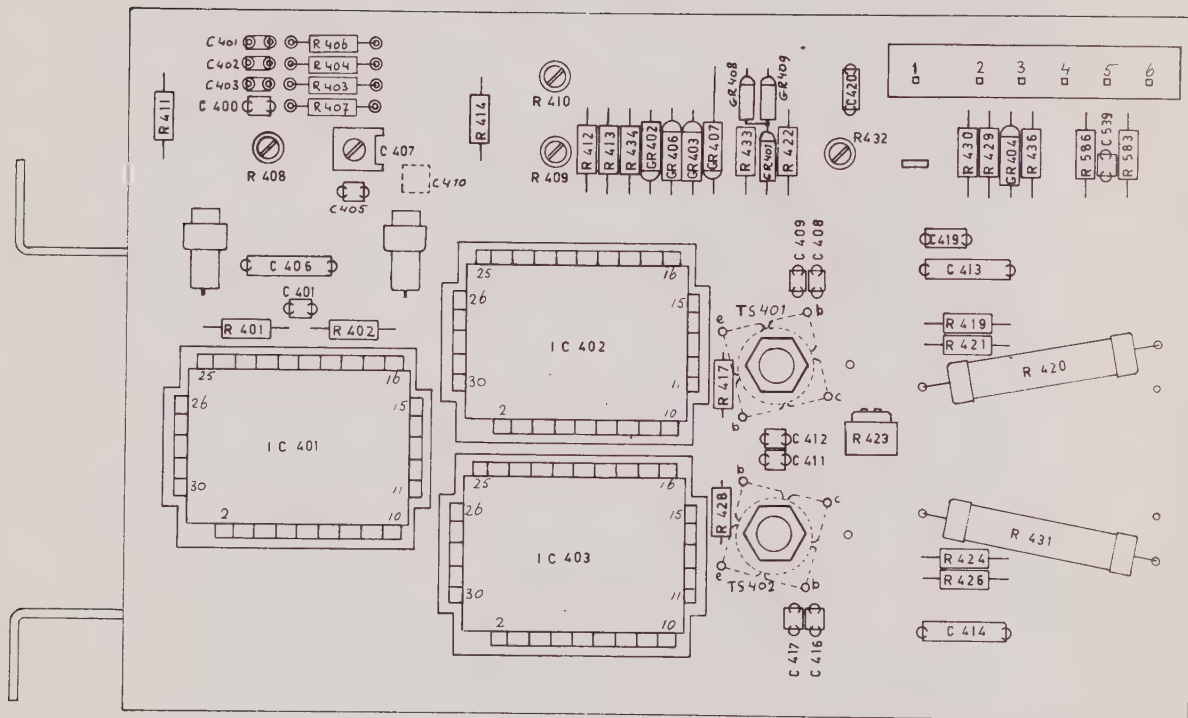




Intermediate amplifier, assy

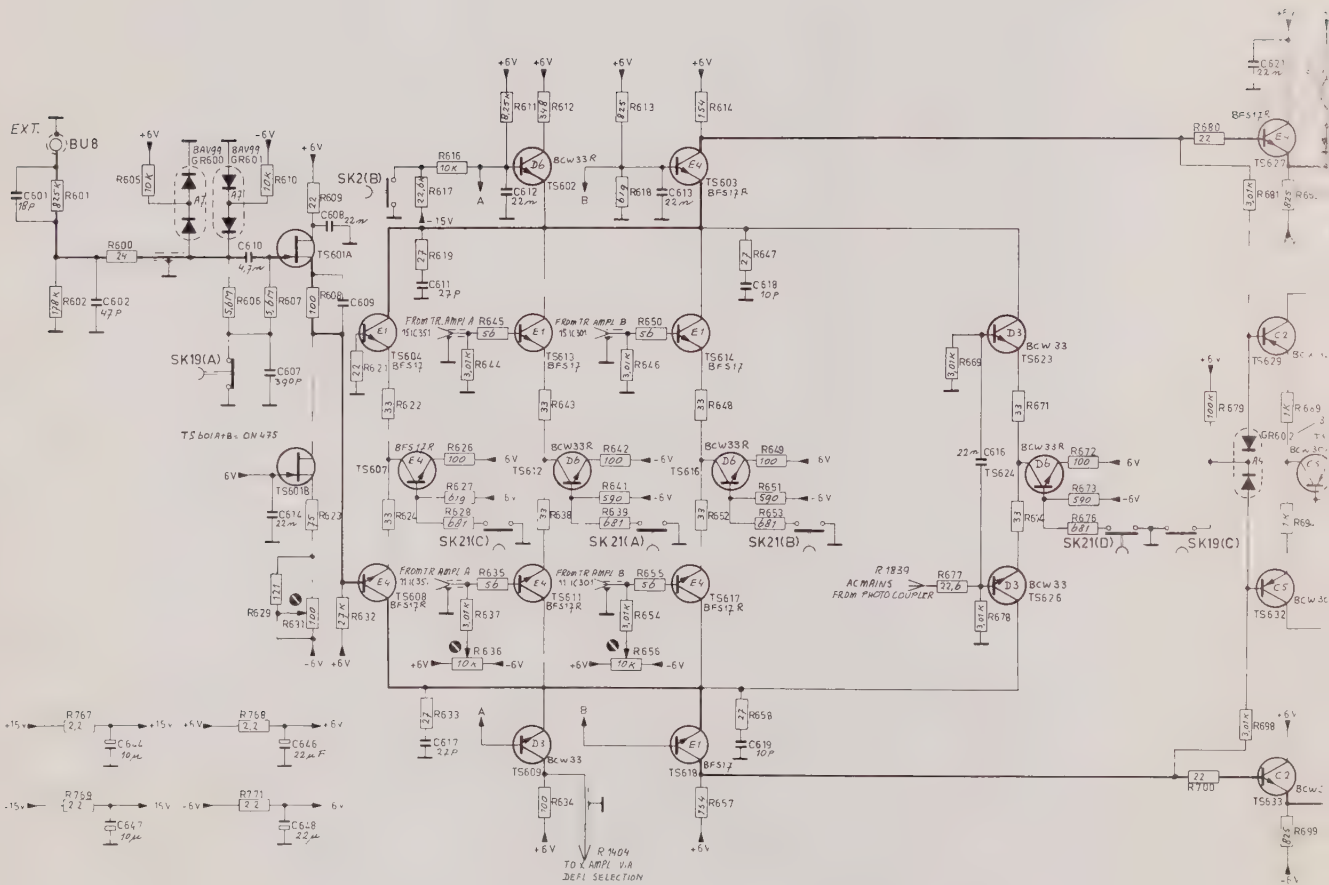
④

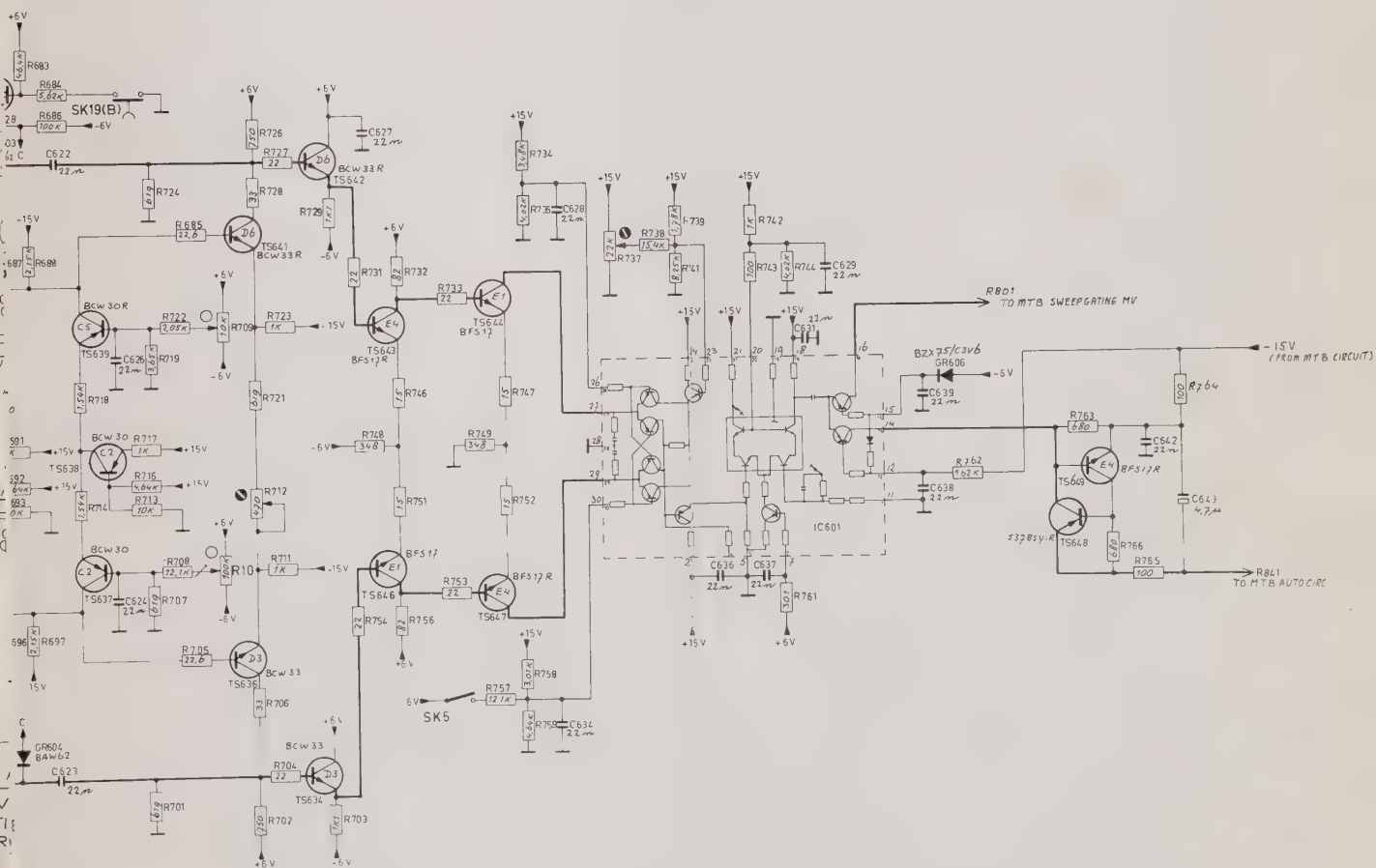




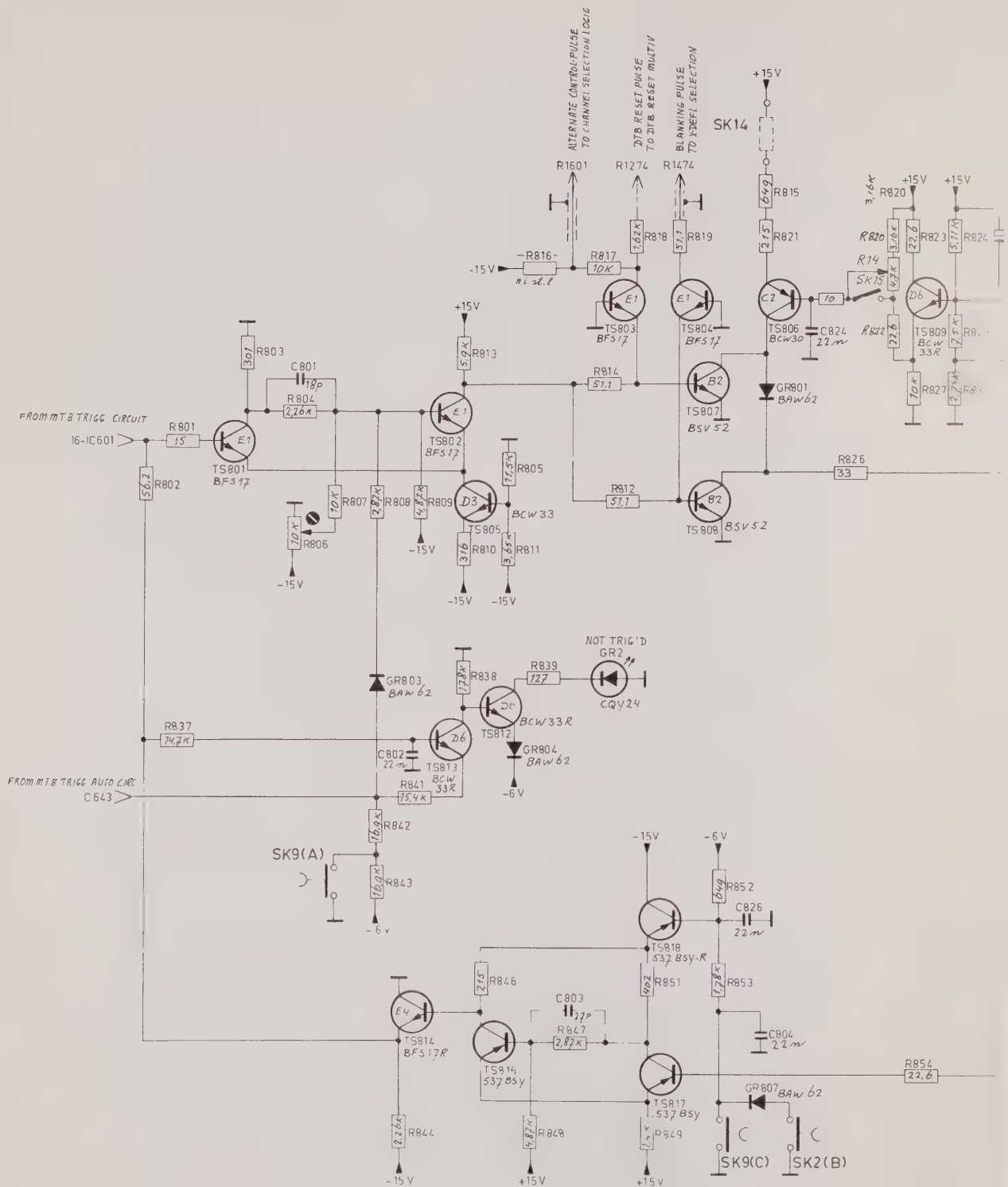
Final Y amplifier,
assy

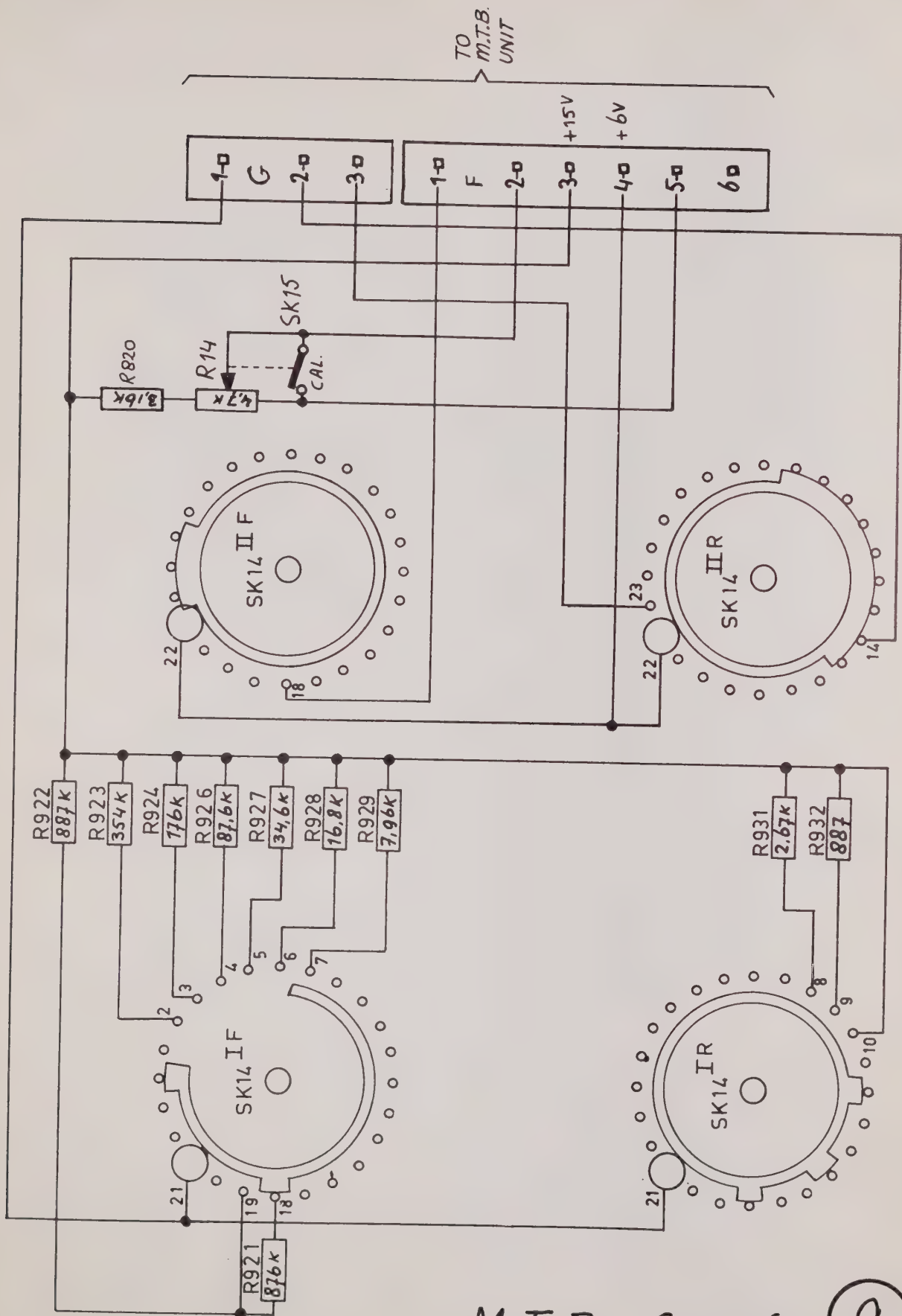
6





M.T.B. Trigger unit ⑦

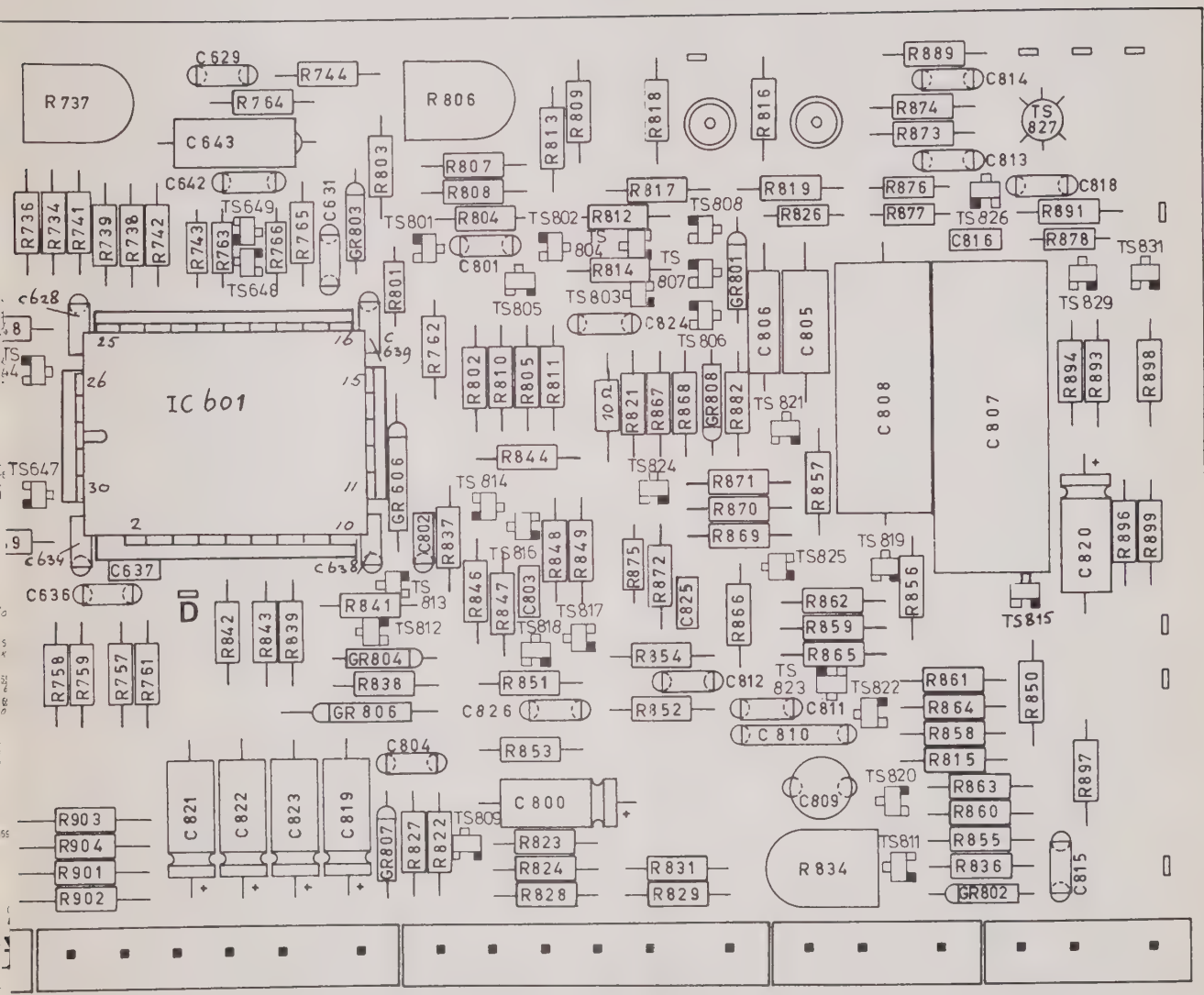




SWITCH DRAWN IN POS. 15/21V.

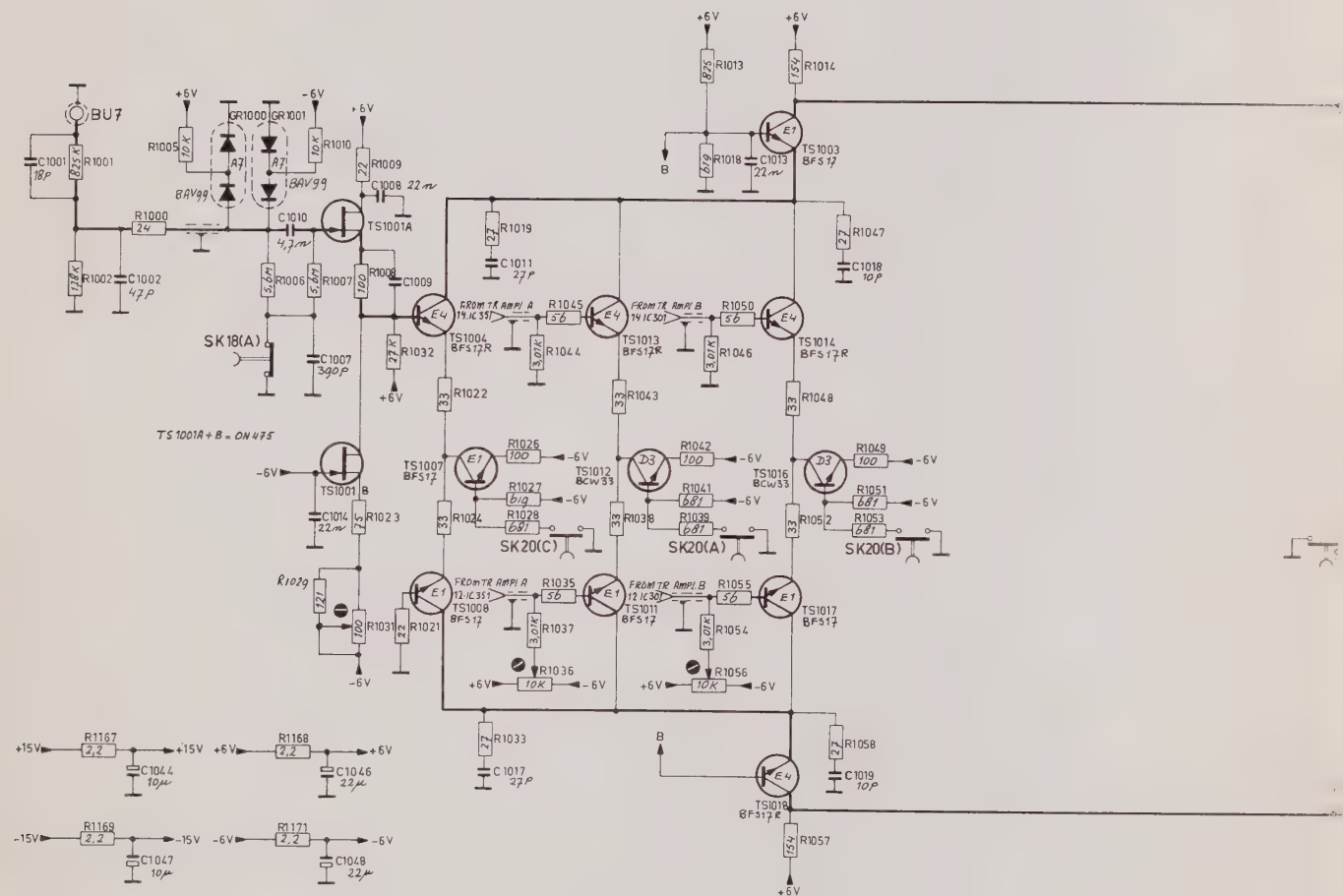
M.T.B. Switch (9)

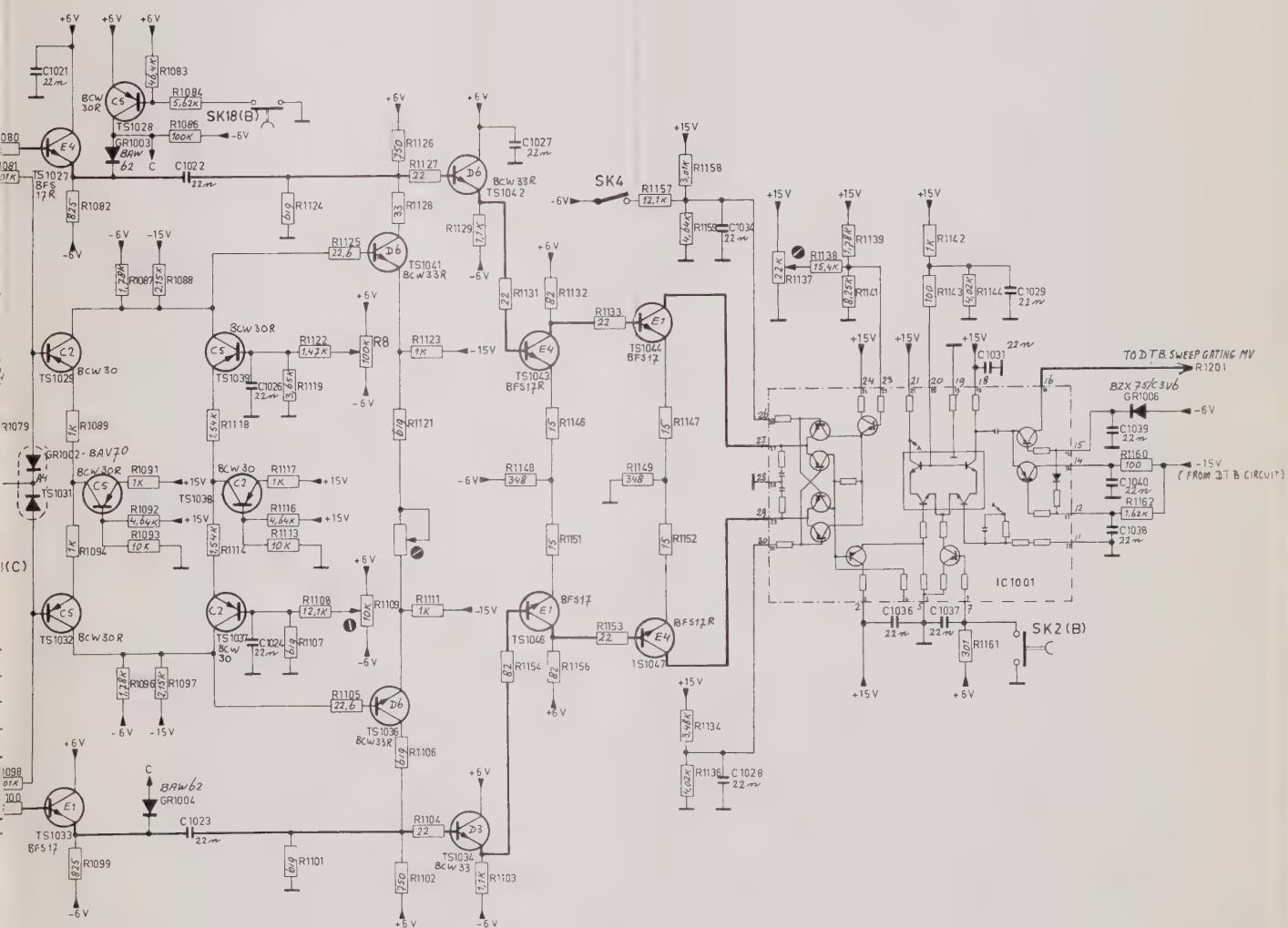


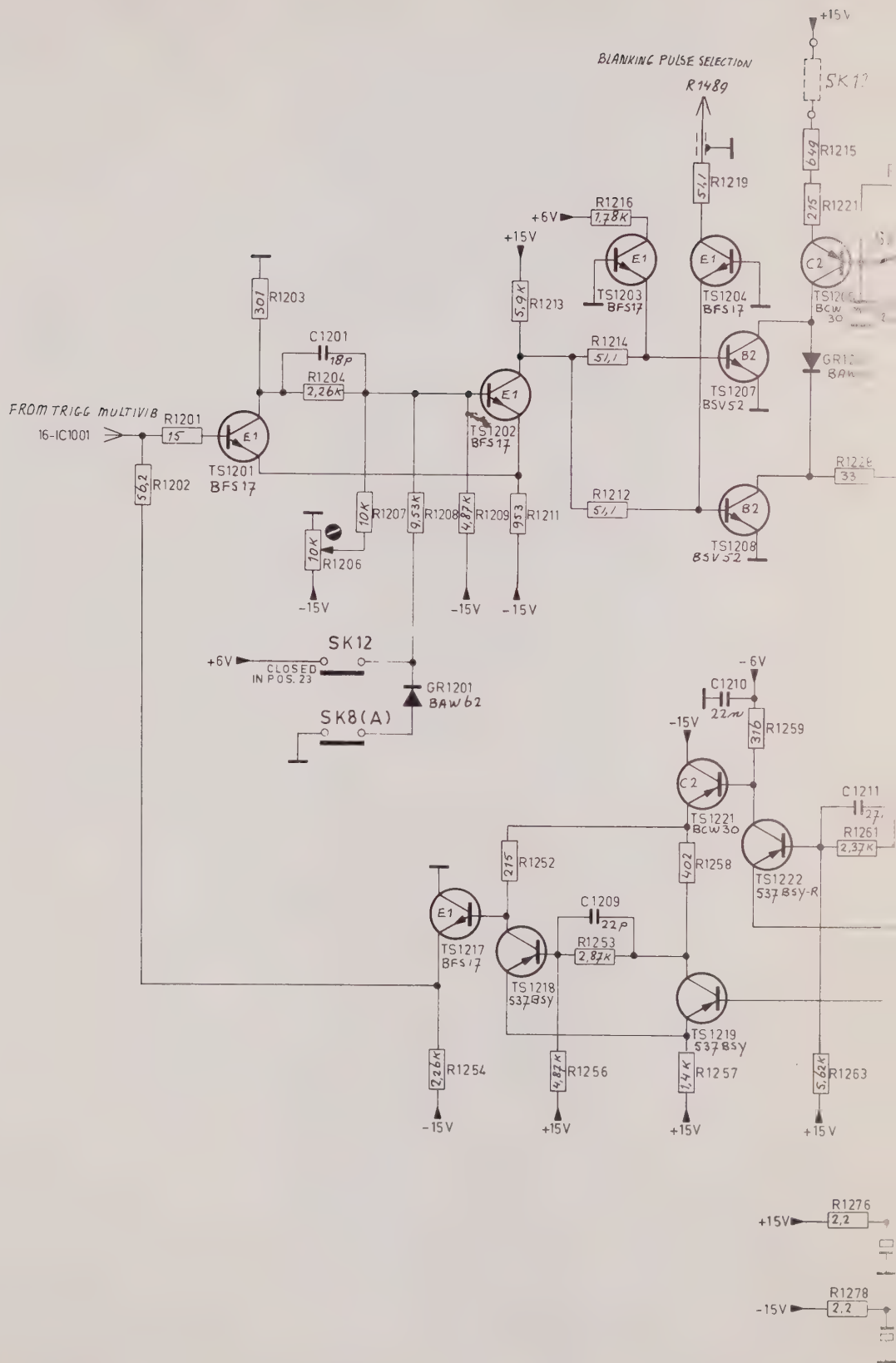


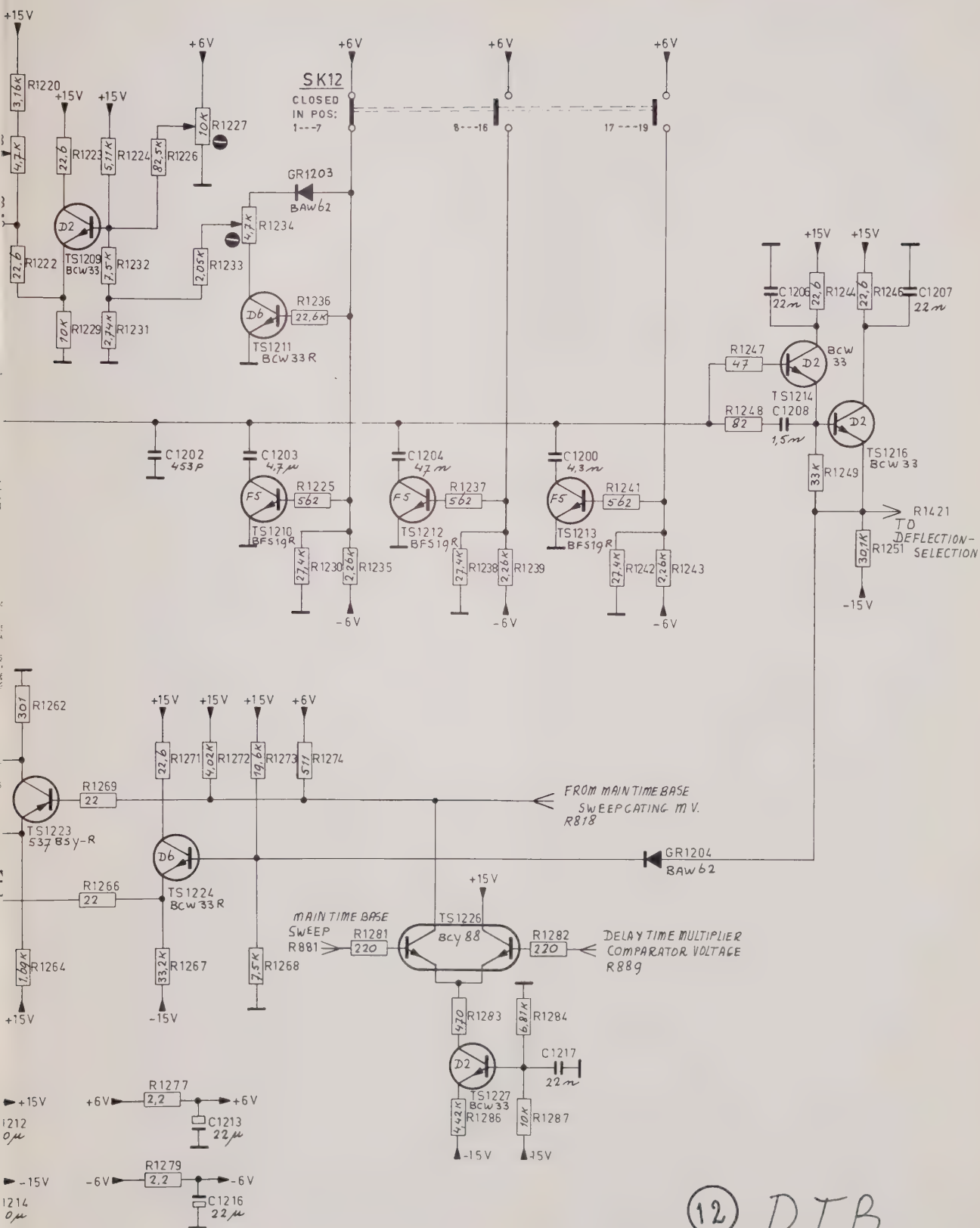
MA 8625

⑩ M.T.B. assy

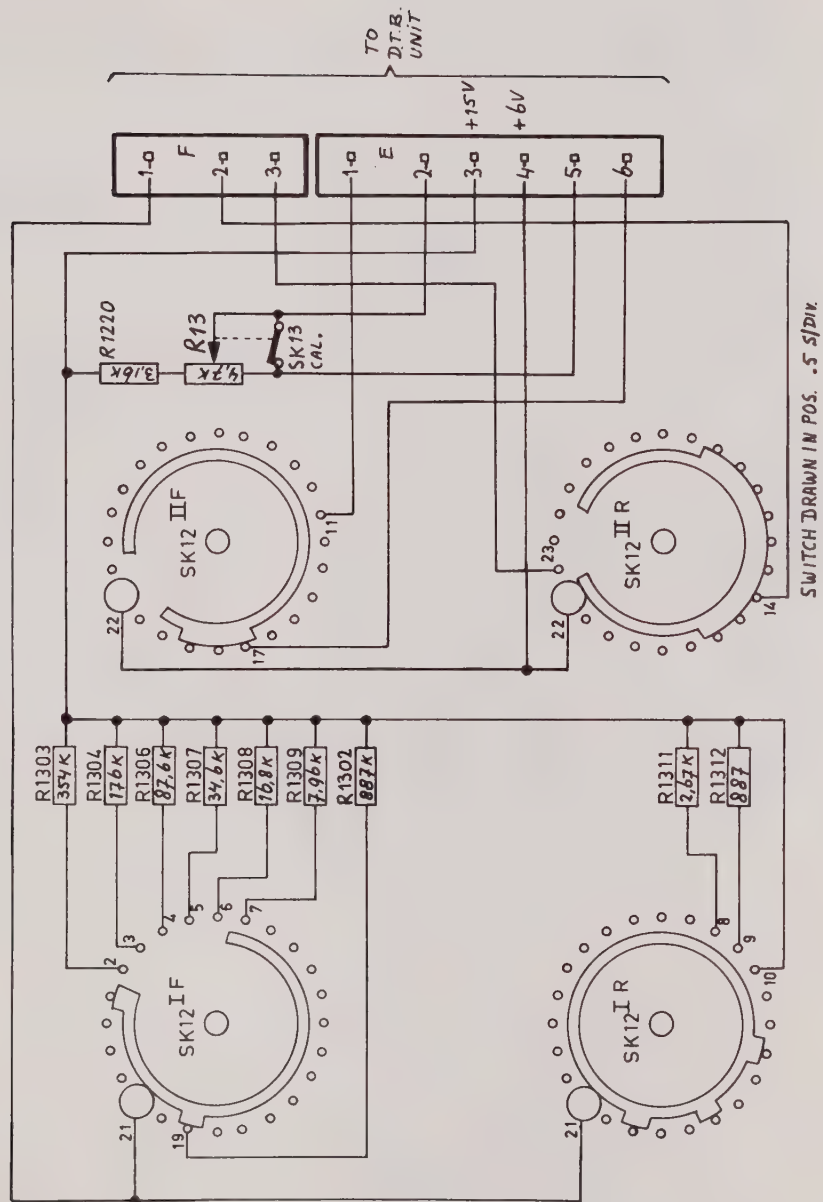








(12) D.T.B.
Sweep unit

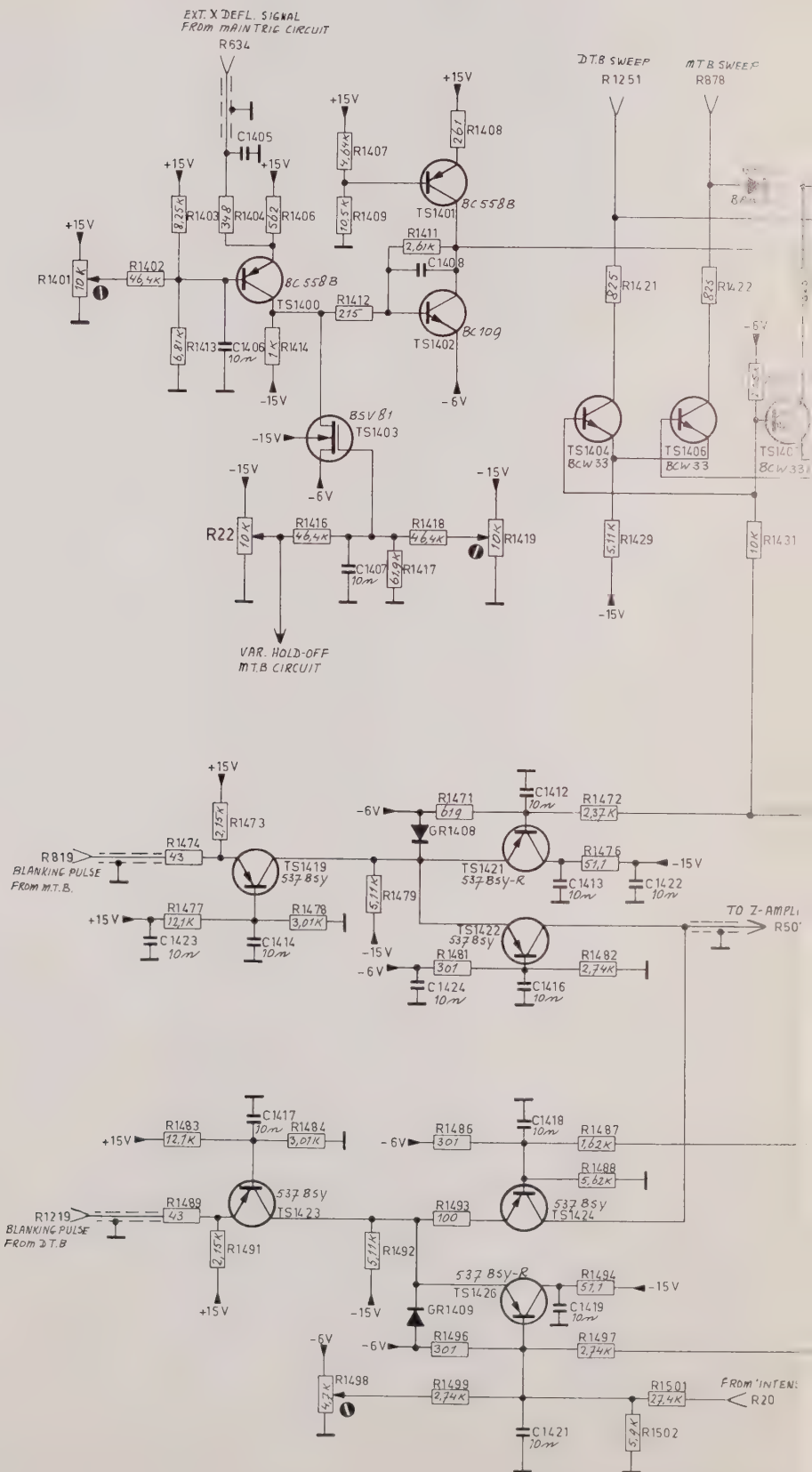


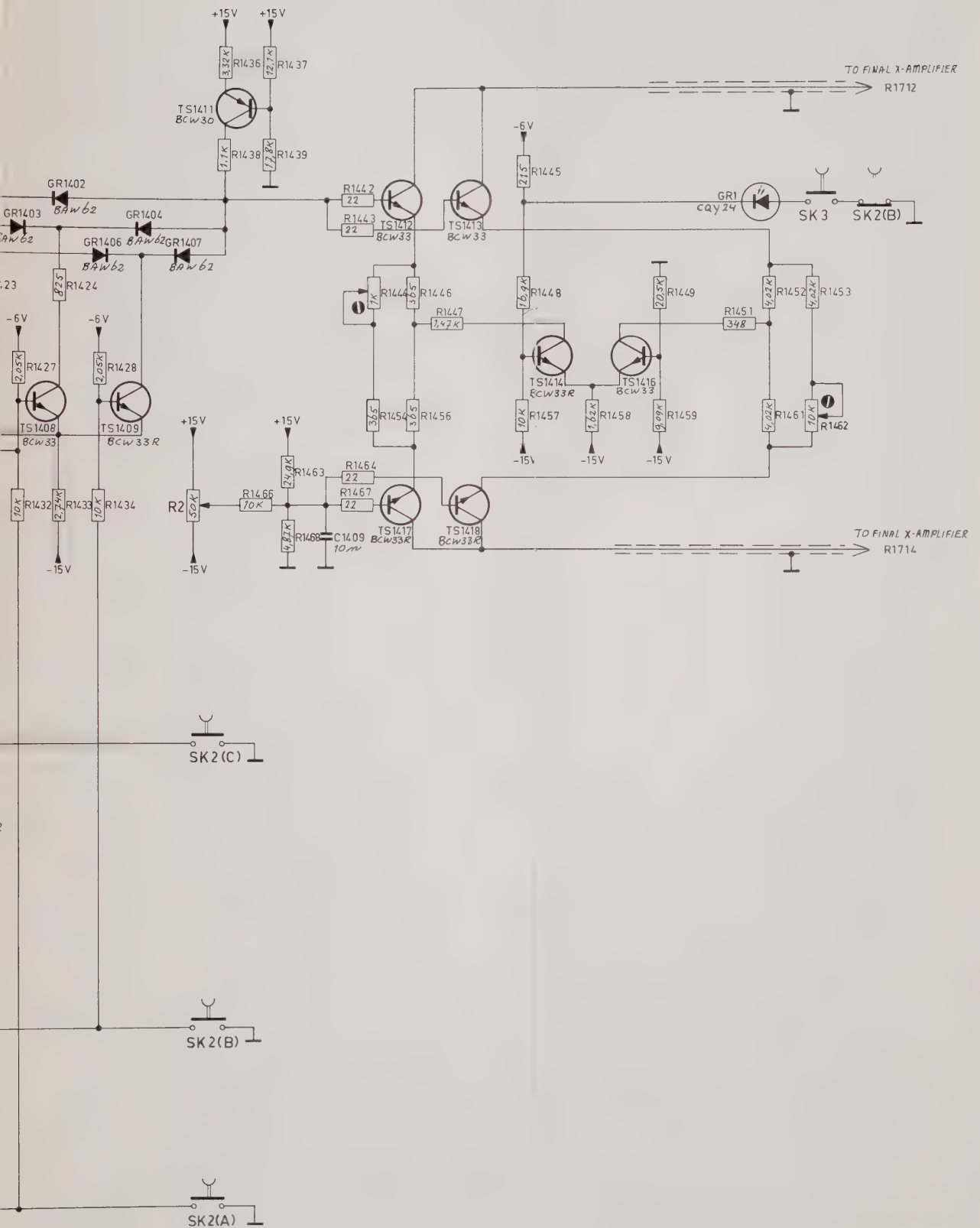
D.T.B. Switch



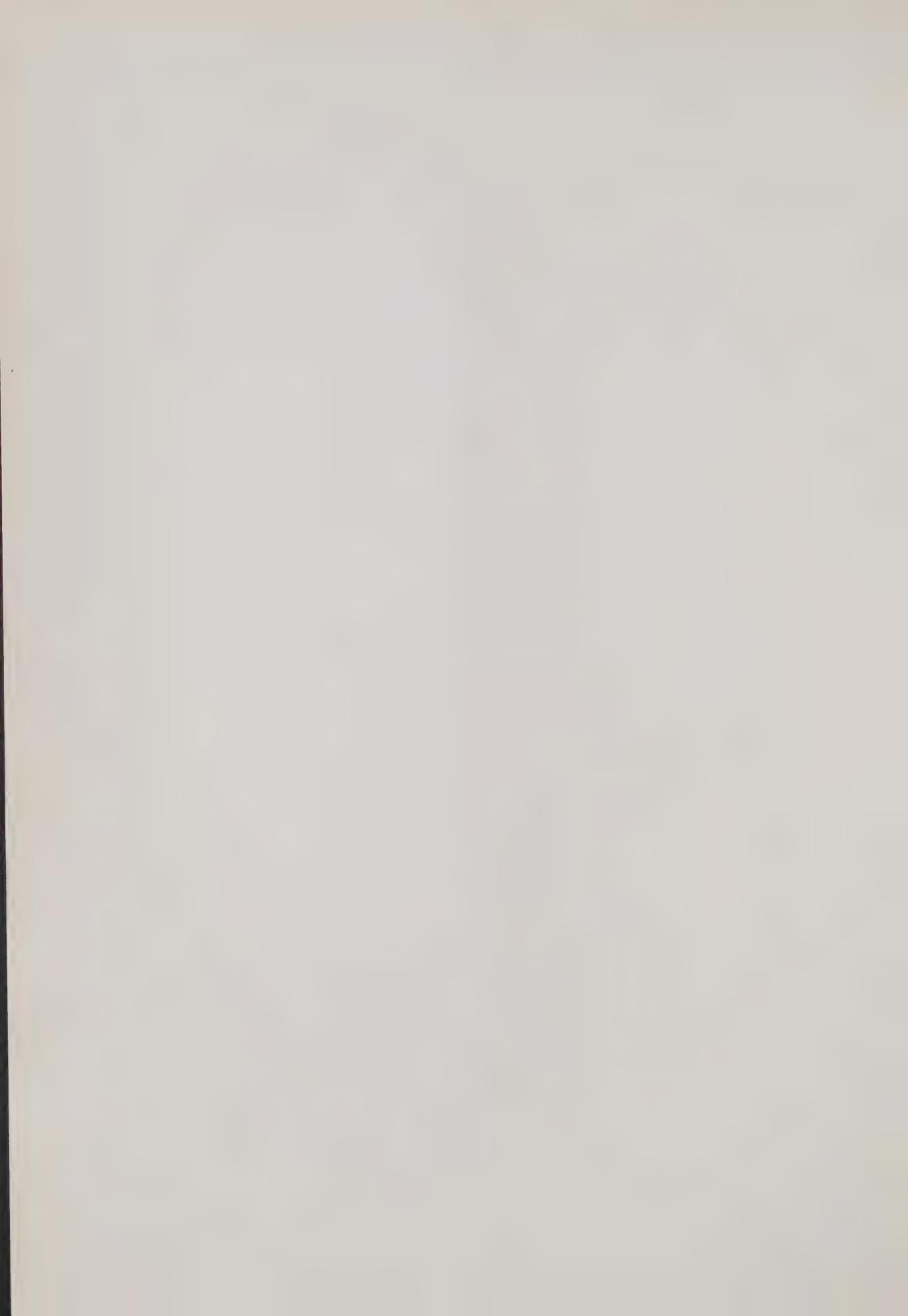


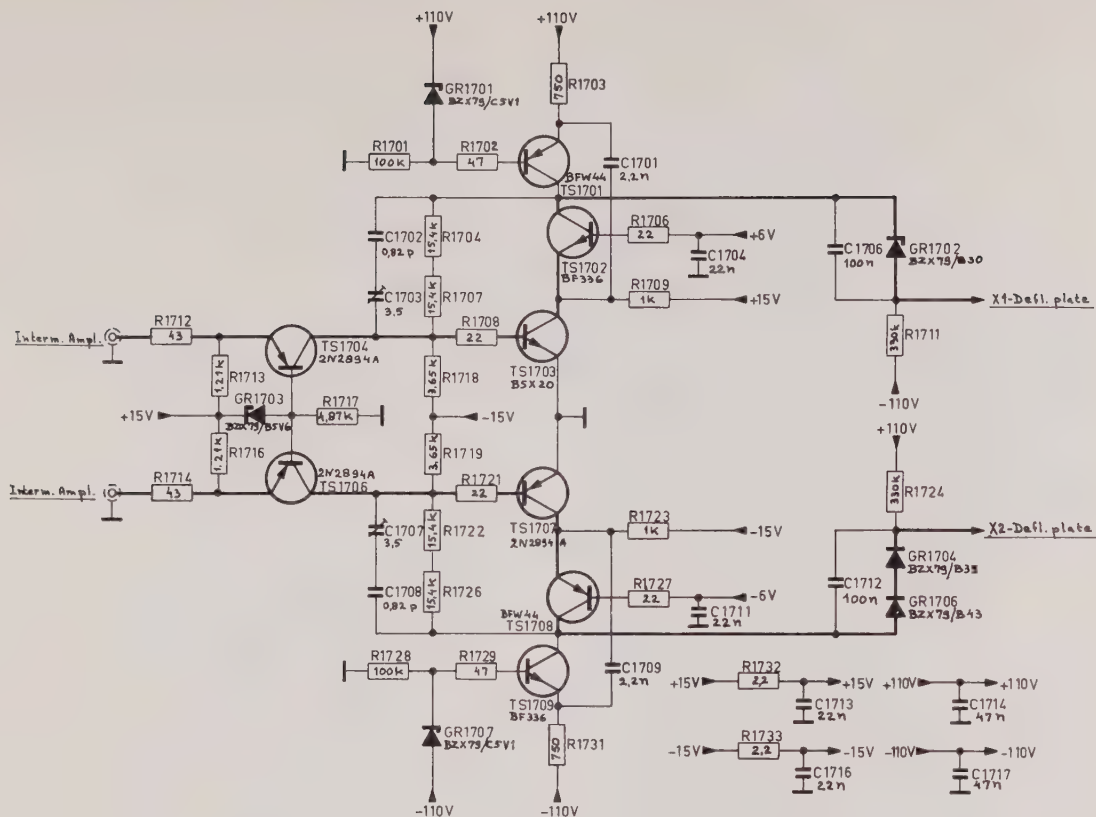
14





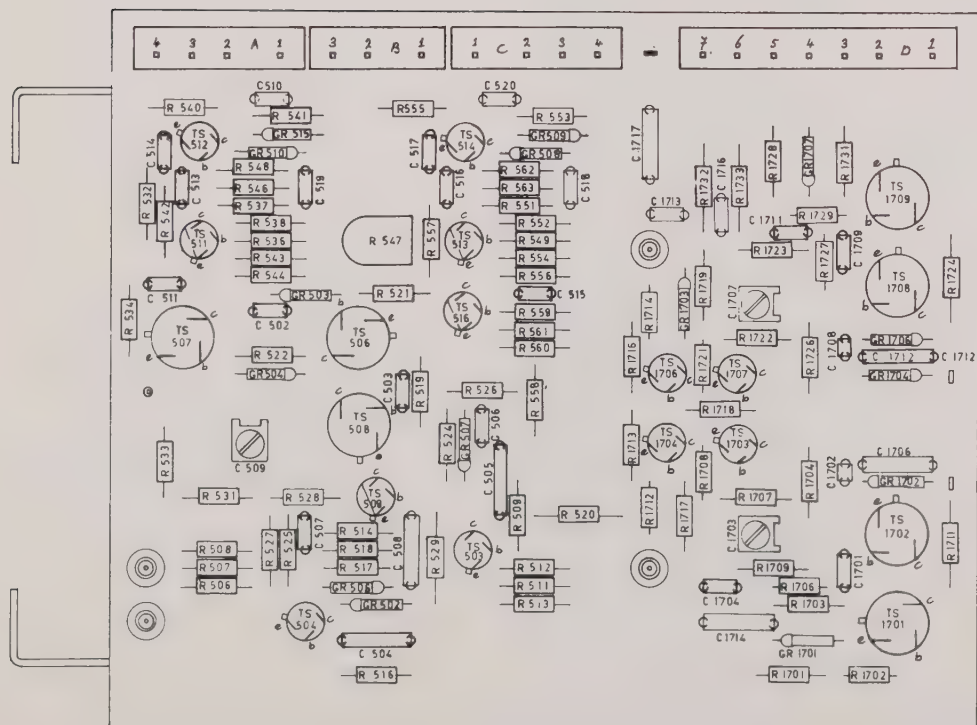
X Deflection selector (15)





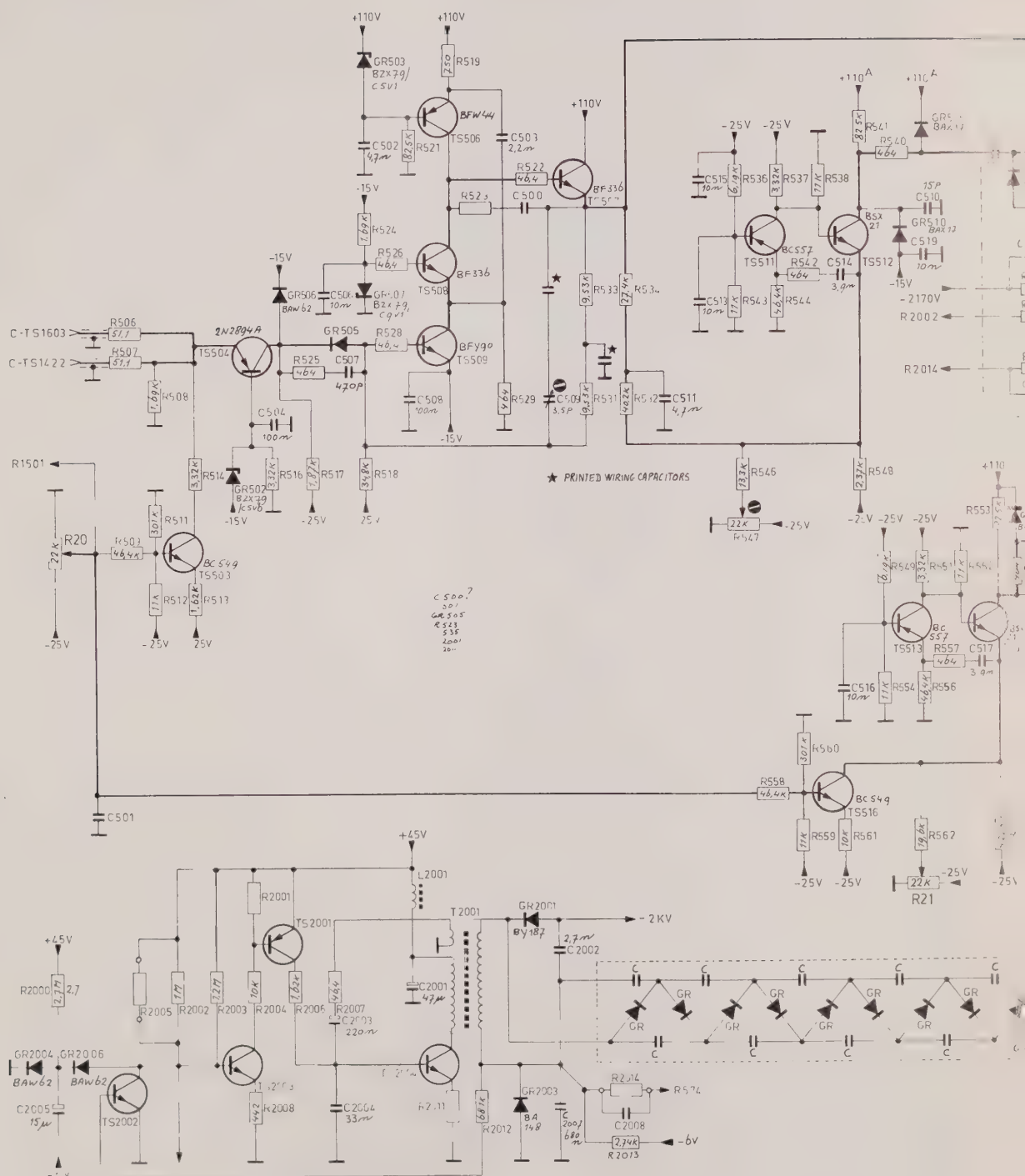
Final X amplifier

17

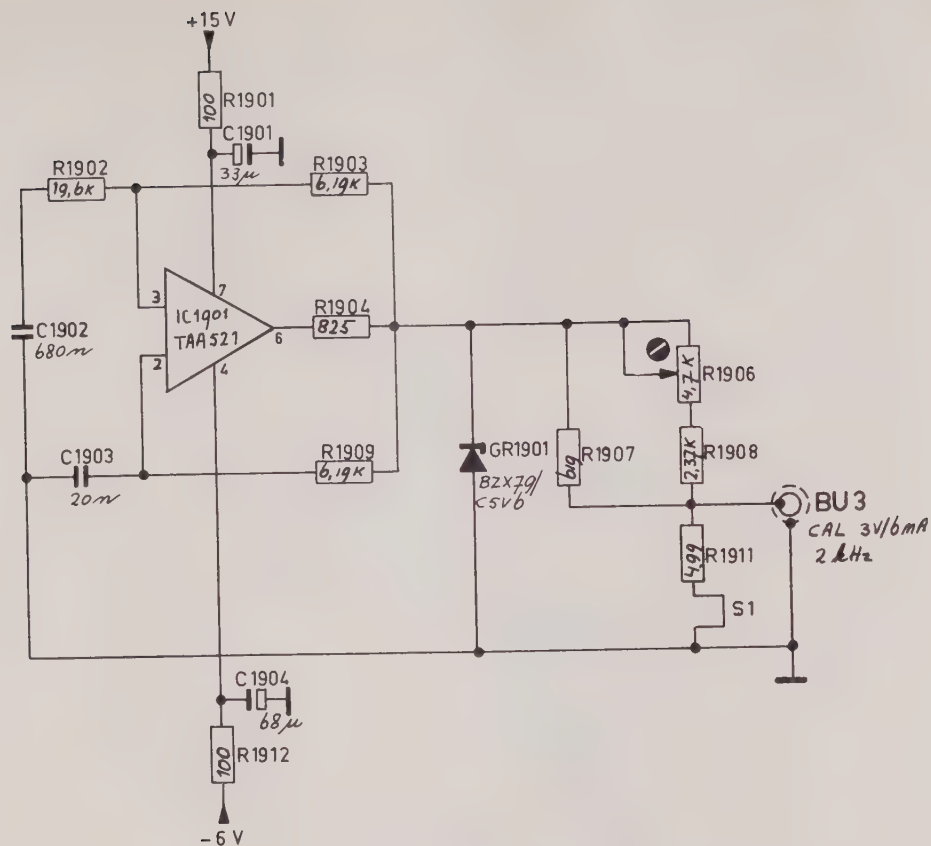


Final X amplifier,
assy

(18)

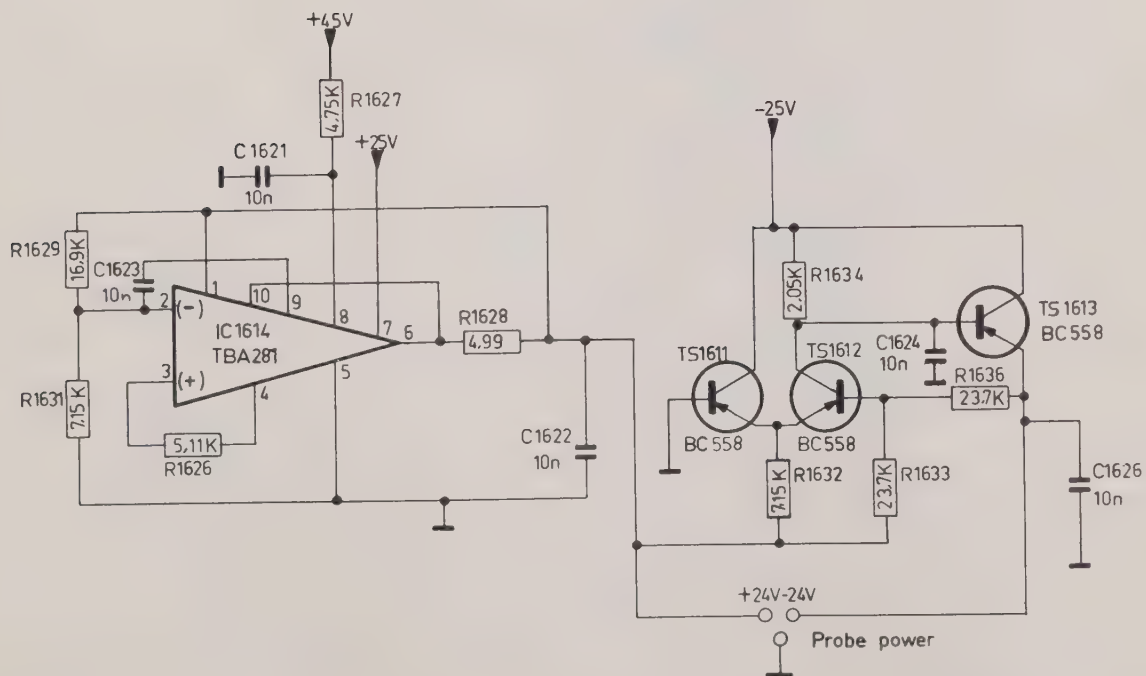






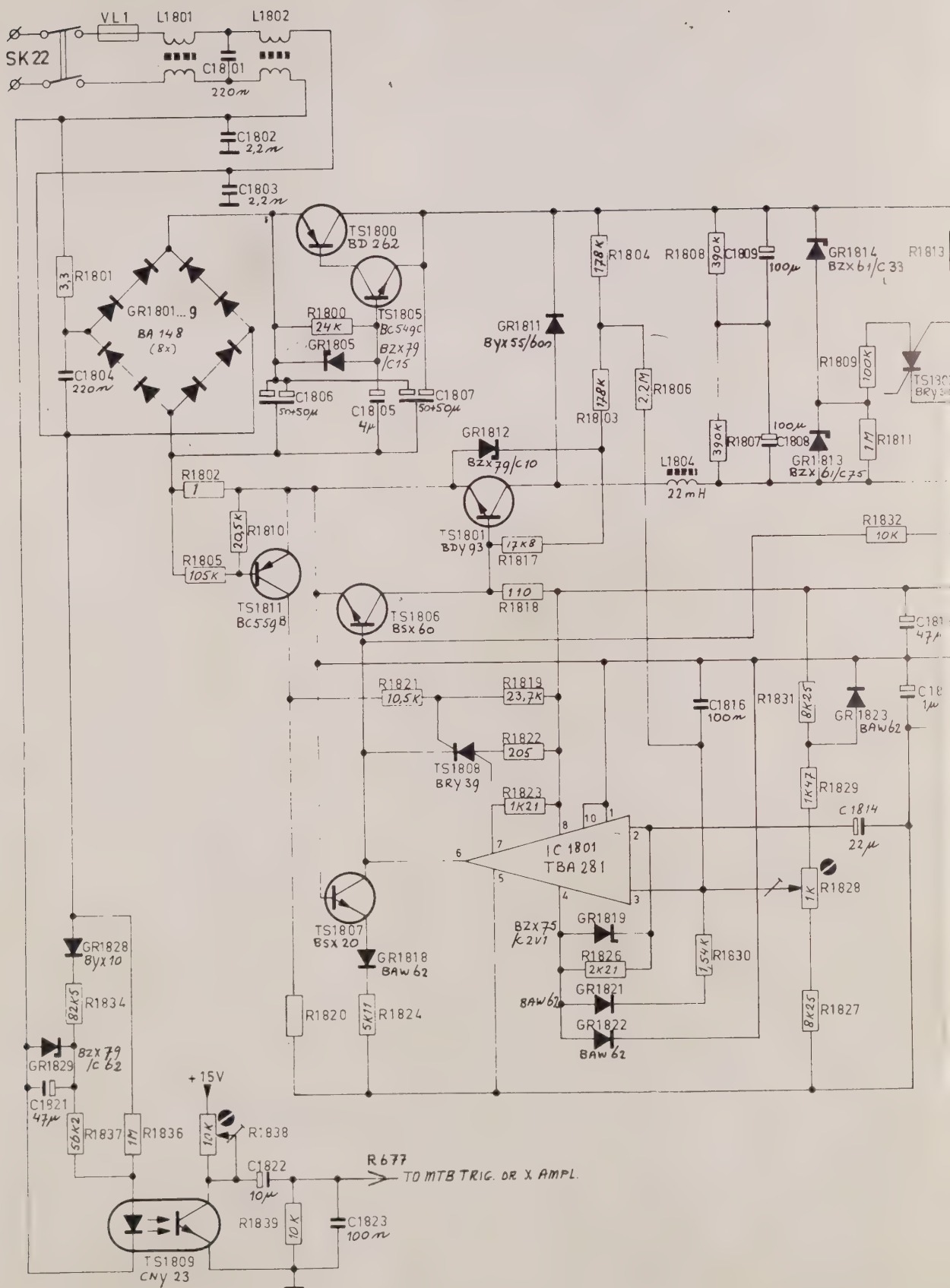
Calibration unit

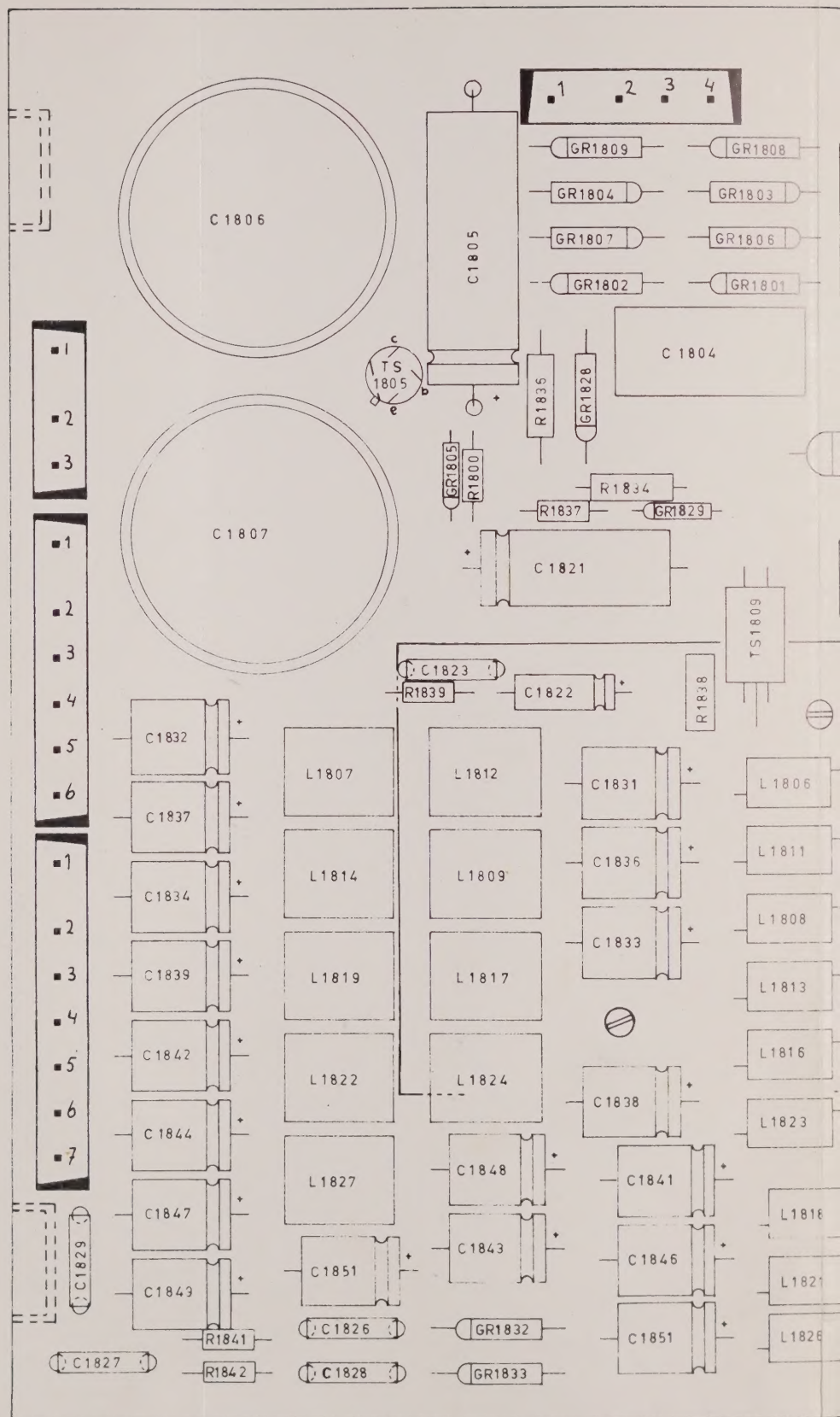
(21)



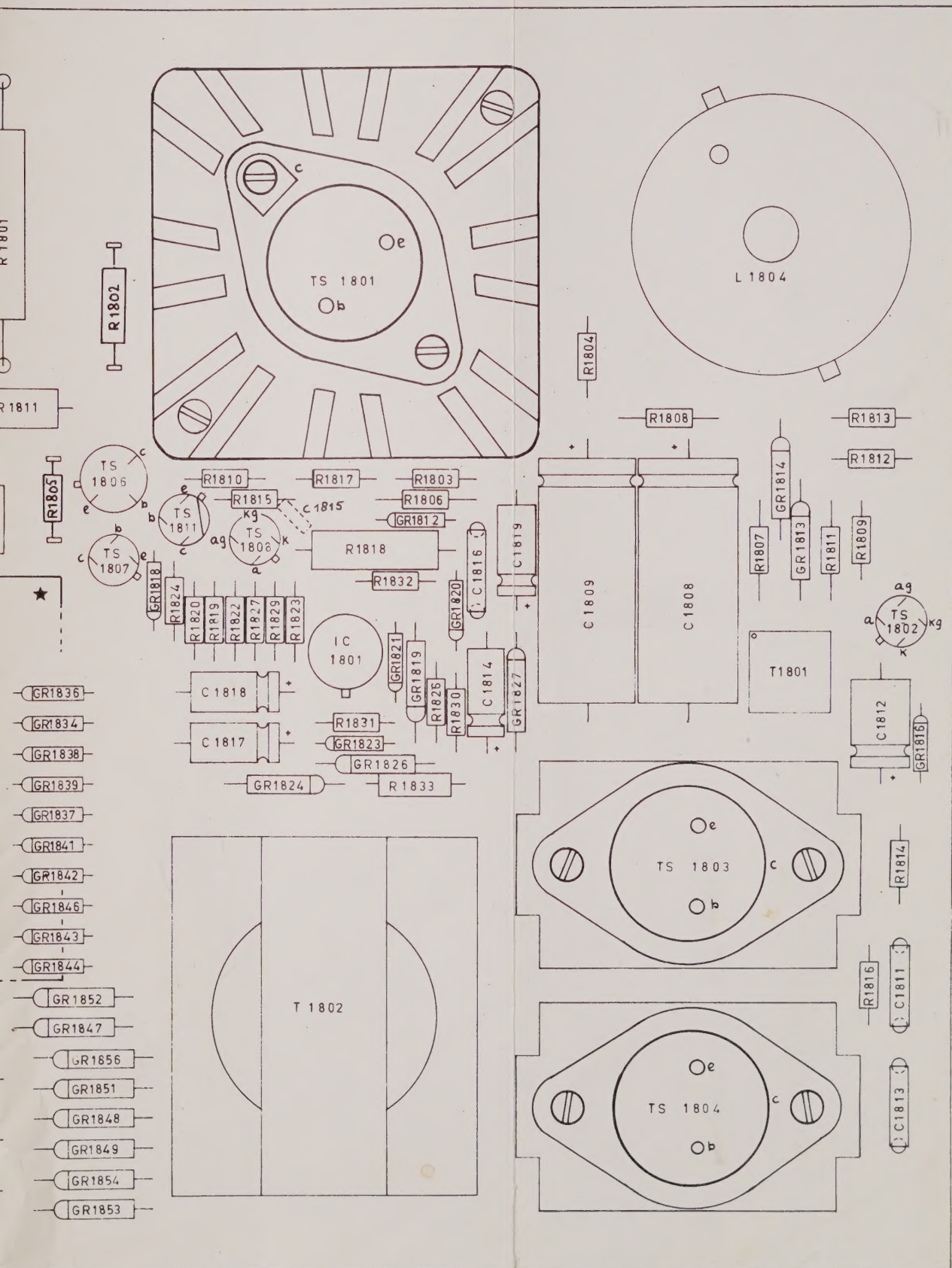
MA8652

Probe power (21)

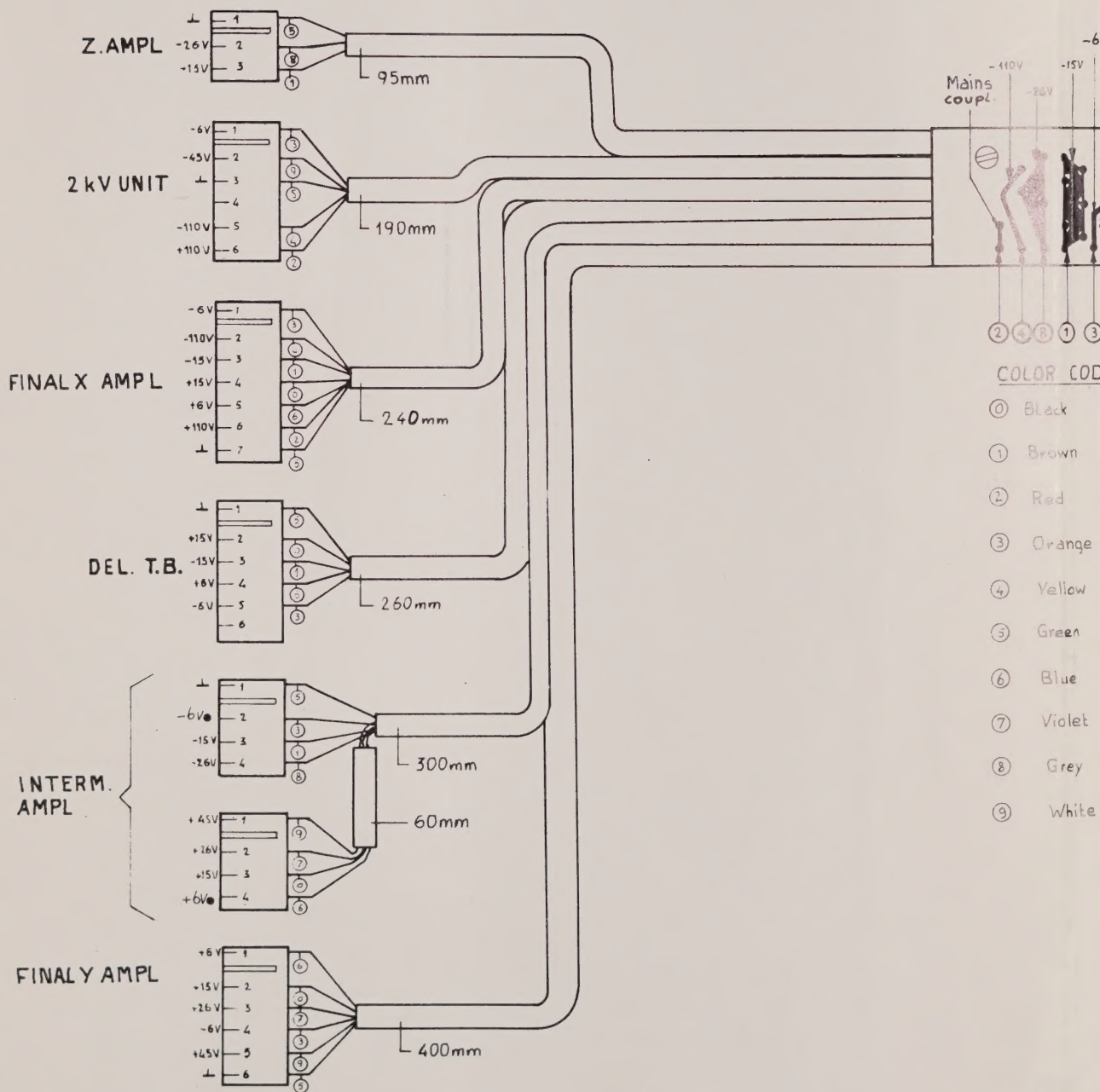


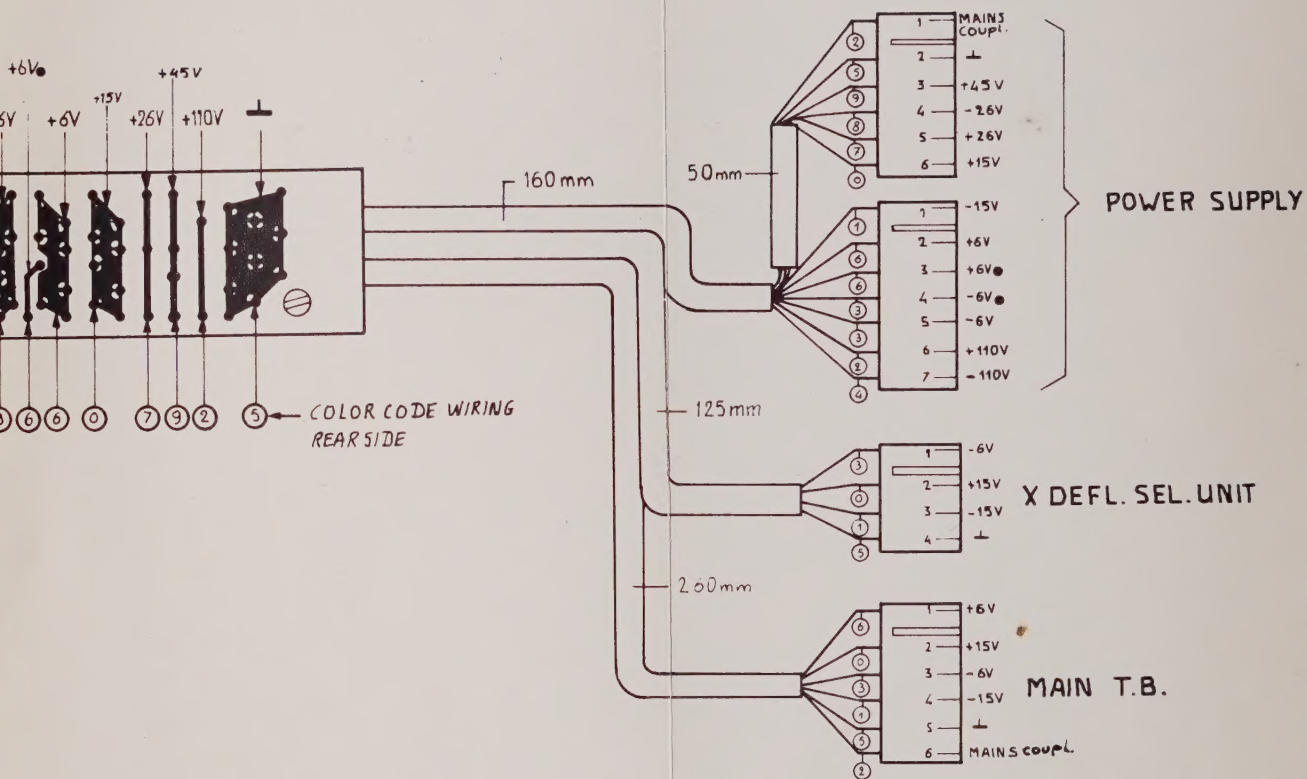


★ C.R.T. HEATER SUPPLY PRINT
CONTAINING: C 1820, 1824, 1825, GR1831, R1843



Power supply, assy





MA 8647

Power distribution